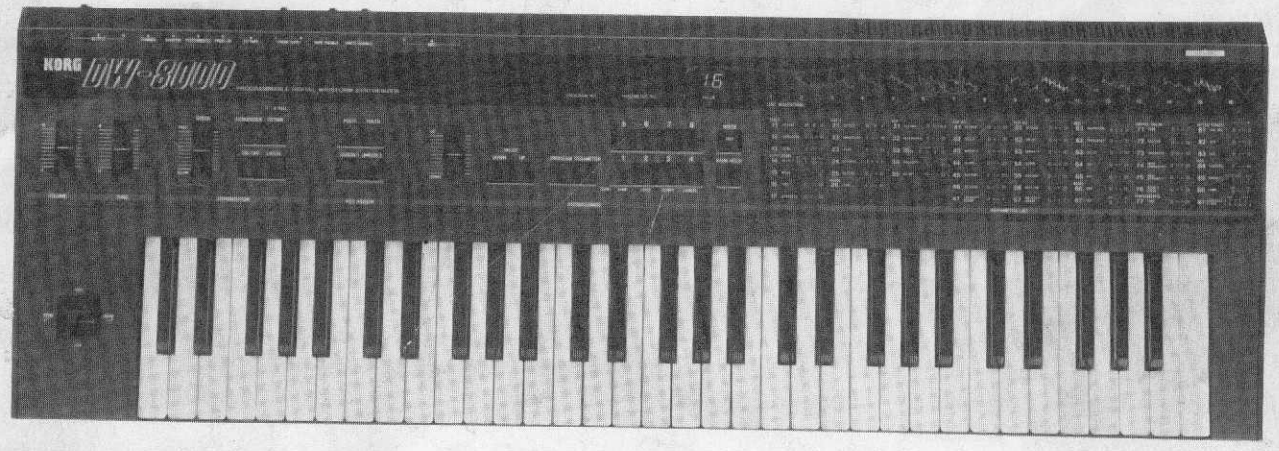
KORG®

PROGRAMMABLE DIGITAL WAVEFORM SYNTHESIZER

DW-8000



SERVICE MANUAL

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KORG INC.
TOKYO/JAPAN

1. SPECIFICATIONS

• Keyboard	61 keys (C ~ C), Initial Touch/After Touch
• Voice	8 voice
• OSC1	Octave (16', 8', 4'), Waveform (1 ~ 16), Level adjustment
• OSC2	Octave (16', 8', 4'), Waveform (1 ~ 16), Interval (Unison, Minor 3rd, Major 3rd, Perfect 4th, Perfect 5th), Detune (25 cents MAX), Level adjustment
• Auto bend	Select (OFF, OSC1, OSC2, Both), Mode (UP/DOWN), Time, Intensity
• Noise	Level adjustment (White noise)
• VCF	Cutoff frequency, Resonance, Keyboard track (0, 1/4, 1/2, 1), EG polarity (,), EG intensity
• VCF EG	Attack time, Decay time, Breakpoint level, Slope time, Sustain level, Release time, Velocity sens
• VCA EG	Attack time, Decay time, Breakpoint level, Slope time, Sustain level, Release time, Velocity sens
• MG	Waveform (, , ,), Frequency, Delay time, OSC intensity, VCF intensity
• Bend	Max. OSC bend (±1 octave), VCF bend ON/OFF
• Portamento	Portamento time
• Digital delay	Time (approx. 4 ~ 512ms), Factor (x0.5 ~ 1.0), Feedback level, Modulation frequency (max. 10Hz), Modulation intensity, Effect level
• After touch	OSC MG, VCF, VCA
• Key assign mode	POLY 1, POLY 2, UNISON 1, UNISON 2
• MIDI	Send/receive channel (ch 1 ~ 16), ENABLE (NOTE DATA/ALL), OMNI (ON/OFF), Arpeggio clock
• Volume	(0 ~ max.)
• Tune	±50 cents
• Joystick	X axis (OSC bend, VCF bend), + Y axis (OSC modulation), –Y axis (VCF modulation)
• Arpeggiator	ON/OFF, Assign (UP/DOWN Mode or ASSIGNABLE mode), Octave (1, 2, full), Latch (ON/OFF), Speed control slider (Arpeggio tempo: = approx. 20 ~ 250)
• Programmer	Value (edit slider, UP/DOWN switches), PROGRAM/PARAMETER switches, Number select buttons (1 ~ 8), WRITE switch, BANK HOLD switch
• Display	Program number, Parameter number, Parameter value
• Tape interface	Save, Load, Verify, Cancel
• Input jacks	FROM TAPE (HIGH/LOW), DAMPER (, GND), PORTAMENTO (, GND), Program UP (, GND)
• Output jacks	Output (R, L/MONO, HIGH/LOW), PHONES, TO TAPE
• Tape switch	ENABLE/DISABLE
• Write switch	ENABLE/DISABLE
• MIDI jacks	IN, OUT, THRU
• Power consumption	31W
• Power supply	Local voltage
• Weight	10.9kg
• Dimensions	998(W) x 338(D) x 101(H)mm
• Accessories	AC power cord, Connection cord, Data cassette, Program card

2. MIDI IMPLEMENTATION

1. TRANSMITTED DATA

1. Channel messages

STATUS	SECOND	THIRD	DESCRIPTION
1 0 0 0 n n n n	0 k k k k k k k	0 1 0 0 0 0 0 0	NOTE OFF kkkkkkk = 36 – 96
1 0 0 1 n n n n	0 k k k k k k k	0 v v v v v v v	NOTE ON kkkkkkk = 36 – 96 vvvvvv = 15 – 127 (40 STEPS)
1 0 1 1 n n n n	0 0 0 0 0 0 0 1	0 v v v v v v v	OSC MODULATION vvvvvv = 0 – 127 (31 STEPS)
1 0 1 1 n n n n	0 0 0 0 0 0 1 0	0 v v v v v v v	VCF MODULATION vvvvvv = 0 – 127 (31 STEPS)
1 0 1 1 n n n n	0 1 0 0 0 0 0 0	0 0 0 0 0 0 0 0	DAMPER PEDAL OFF
1 0 1 1 n n n n	0 1 0 0 0 0 0 0	0 1 1 1 1 1 1 1	DAMPER PEDAL ON
1 0 1 1 n n n n	0 1 0 0 0 0 0 1	0 0 0 0 0 0 0 0	PORTAMENTO OFF
1 0 1 1 n n n n	0 1 0 0 0 0 0 1	0 1 1 1 1 1 1 1	PORTAMENTO ON
1 1 0 0 n n n n	0 p p p p p p p	—	PROGRAM CHANGE (NOTE 1) ppppppp = 0 – 63
1 1 0 1 n n n n	0 v v v v v v v	—	CHANNEL PRESSURE (AFTER-TOUCH) vvvvvv = 0 – 127 (63 STEPS)
1 1 1 0 n n n n	0 0 0 0 0 0 0 0	0 b b b b b b b	PITCH BENDER CHANGE bbbbbbb = 0 – 127 (bbbbbbb = 64 : CENTER)

★ nnnn = 0 ~ 15: channel number specified by parameter 84.

NOTE: 1. PROGRAM NUMBER (0ppppppp) correspond to DISPLAY NUMBER on the PANEL which will be the following:

DISPLAY NUMBER	PROGRAM NUMBER
#11	0
#12	1
:	:
#87	62
#88	63

2. System real time messages

STATUS	DESCRIPTION
1 1 1 1 1 0 0 0	TIMING CLOCK (NOTE 2)
1 1 1 1 1 0 1 0	START (NOTE 2)
1 1 1 1 1 1 0 0	STOP (NOTE 2)
1 1 1 1 1 1 1 0	ACTIVE SENSING (NOTE 3)

NOTES: 2. Can be sent when "internal clock" has been specified by parameter 87 (Arpeggio clock).
3. Sent at intervals of 300ms or less.

3. System exclusive messages

(a) DEVICE ID

BYTE	DESCRIPTION
1 1 1 1 0 0 0 0	EXCLUSIVE STATUS
0 1 0 0 0 0 1 0	KORG ID 42H
0 0 1 1 n n n n	FORMAT ID 3*H (* = ch)
0 0 0 0 0 0 1 1	DW-8000 ID 03H
1 1 1 1 0 1 1 1	EOX

★ nnnn = 0 ~ 15: channel number (channel to transmit exclusive messages) specified by parameter 84.

NOTE: 4. If receive DEVICE ID REQUEST, DEVICE ID message will be sent.

(b) WRITE COMPLETED

BYTE	DESCRIPTION
1 1 1 1 0 0 0 0	EXCLUSIVE STATUS
0 1 0 0 0 0 1 0	KORG ID 42H
0 0 1 1 n n n n	FORMAT ID 3*H (* = ch)
0 0 0 0 0 0 1 1	DW-8000 ID 03H
0 0 1 0 0 0 0 1	WRITE COMPLETED 21H
1 1 1 1 0 1 1 1	EOX

★ nnnn = 0 ~ 15: channel number (channel to transmit exclusive messages) specified by parameter 84.

NOTE: 5. If WRITE REQUEST is received and program write is completed, a WRITE COMPLETED message will be sent.

(c) WRITE ERROR

BYTE	DESCRIPTION
1 1 1 1 0 0 0 0	EXCLUSIVE STATUS
0 1 0 0 0 0 1 0	KORG ID 42H
0 0 1 1 n n n n	FORMAT ID 3*H (* = ch)
0 0 1 0 0 0 1 1	DW-8000 ID 03H
0 0 1 0 0 0 1 0	WRITE ERROR 22H
1 1 1 1 0 1 1 1	EOX

★ nnnn = 0 ~ 15: channel number (channel to transmit exclusive messages) specified by parameter 84.

NOTE: 6. If WRITE REQUEST is received and program write is not completed (if WRITE DISABLE is chosen on the rear panel), a WRITE ERROR message will be sent.

(d) DATA SAVE (DATA DUMP)

BYTE	DESCRIPTION
1 1 1 1 0 0 0 0	EXCLUSIVE STATUS
0 1 0 0 0 0 1 0	KORG ID 42H
0 0 1 1 n n n n	FORMAT ID 3*H (* = ch)
0 0 0 0 0 0 1 1	DW-8000 ID 03H
0 1 0 0 0 0 0 0	DATA DUMP 40H
0 v v v v v v v	DATA 51 BYTES (See DW-8000 BIT MAP)
⋮	
0 v v v v v v v	
1 1 1 1 0 1 1 1	EOX

★ nnnn = 0 ~ 15: channel number (channel to transmit exclusive messages) specified by parameter 84.

NOTE: 7. If DATA SAVE REQUEST is received, DATA SAVE (DATA DUMP) will be sent.

2. RECOGNIZED RECEIVE DATA

1. Channel messages

STATUS	SECOND	THIRD	DESCRIPTION
1 0 0 0 n n n n	0 k k k k k k k	0 x x x x x x x	NOTE OFF (NOTE 1) velocity will be ignored.
1 0 0 1 n n n n	0 k k k k k k k	0 v v v v v v v	NOTE ON (NOTE 1) vvvvvv = 1 – 127 (15 STEPS)
1 0 0 1 n n n n	0 k k k k k k k	0 0 0 0 0 0 0 0	NOTE OFF (NOTE 1)
1 0 1 1 n n n n	0 0 0 0 0 0 0 1	0 v v v v v x x	OSC MODULATION (5 BITS RESOLUTION)
1 0 1 1 n n n n	0 0 0 0 0 0 1 0	0 v v v v v x x	VCF MODULATION (5 BITS RESOLUTION)
1 0 1 1 n n n n	0 0 0 0 0 1 1 1	0 v v v v v v v	VOLUME (7 BITS RESOLUTION)
1 0 1 1 n n n n	0 1 0 0 0 0 0 0	0 0 0 0 0 0 0 0	DAMPER PEDAL OFF
1 0 1 1 n n n n	0 1 0 0 0 0 0 0	0 1 1 1 1 1 1 1	DAMPER PEDAL ON
1 0 1 1 n n n n	0 1 0 0 0 0 0 1	0 0 0 0 0 0 0 0	PORTAMENTO OFF
1 0 1 1 n n n n	0 1 0 0 0 0 0 1	0 1 1 1 1 1 1 1	PORTAMENTO ON
1 0 1 1 n n n n	0 1 1 1 1 0 1 1	0 0 0 0 0 0 0 0	ALL NOTES OFF
1 0 1 1 n n n n	0 1 1 1 1 1 0 0	0 0 0 0 0 0 0 0	OMNI MODE OFF (ALL NOTES OFF)
1 0 1 1 n n n n	0 1 1 1 1 1 0 1	0 0 0 0 0 0 0 0	OMNI MODE ON (ALL NOTES OFF)
1 0 1 1 n n n n	0 1 1 1 1 1 1 0	0 x x x x x x x	(ALL NOTES OFF)
1 0 1 1 n n n n	0 1 1 1 1 1 1 1	0 0 0 0 0 0 0 0	(ALL NOTES OFF)
1 1 0 0 n n n n	0 p p p p p p p	—	PROGRAM CHANGE (NOTE 2)
1 1 0 1 n n n n	0 v v v v v v x	—	AFTER TOUCH (6 BITS RESOLUTION)
1 1 1 0 n n n n	0 x x x x x x x	0 b b b b b b b	PITCH BENDER CHANGE LSB will be ignored. MSB will be recognized. (bbbbbbb = 64 : CENTER)

★ nnnn = 0 ~ 15:
Channel number specified by parameter 84. When the mode is OMNI ON, all the data will be received. When the mode is OMNI OFF, only data of the channel designated by the parameter will be received. As to MODE MESSAGE, however, designated channel data only will be received even if the mode is OMNI ON.

NOTES: 1. NOTE NUMBER (0kkkkkkk) = 24 ~ 108. If data outside this range is received, the data will be transposed to the same note on the nearest octave.
2. PROGRAM NUMBER (0ppppppp) = 0 ~ 63. If the data is larger than 63, it will be recognized as a number that has 64 subtracted from it.

2. System real time messages

STATUS	DESCRIPTION
1 1 1 1 1 0 0 0	TIMING CLOCK (NOTE 3)
1 1 1 1 1 0 1 0	START (NOTE 3)
1 1 1 1 1 1 0 0	STOP (NOTE 3)
1 1 1 1 1 1 1 0	ACTIVE SENSING (NOTE 4)

NOTES: 3. Can be received if external clock has been selected by parameter 87 (Arpeggio clock).
4. Should be received at intervals of 300ms or less.

3. System exclusive messages

(a) DEVICE ID REQUEST

BYTE	DESCRIPTION
1 1 1 1 0 0 0 0	EXCLUSIVE STATUS
0 1 0 0 0 0 1 0	KORG ID 42H
0 1 0 0 n n n n	FORMAT ID 4*H (* = ch) (NOTE 5)
1 1 1 1 0 1 1 1	EOX

★ nnnn = 0 ~ 15: channel number (channel to receive exclusive messages) specified by parameter 84.

(b) WRITE REQUEST

BYTE	DESCRIPTION
1 1 1 1 0 0 0 0	EXCLUSIVE STATUS
0 1 0 0 0 0 1 0	KORG ID 42H
0 0 1 1 n n n n	FORMAT ID 3*H (* = ch) (NOTE 5)
0 0 0 0 0 0 1 1	DW-8000 ID 03H
0 0 0 1 0 0 0 1	WRITE REQUEST 11H
0 p p p p p p p	PROGRAM NUMBER (p p p p p p p = 0 – 63)
1 1 1 1 0 1 1 1	EOX

★ nnnn = 0 ~ 15: channel number (channel to receive exclusive messages) specified by parameter 84.

(c) DATA SAVE REQUEST

BYTE	DESCRIPTION
1 1 1 1 0 0 0 0	EXCLUSIVE STATUS
0 1 0 0 0 0 1 0	KORG ID 42H
0 0 1 1 n n n n	FORMAT ID 3*H (* = ch) (NOTE 5)
0 0 0 0 0 0 1 1	DW-8000 ID 03H
0 0 0 1 0 0 0 0	DATA SAVE REQUEST 10H
1 1 1 1 0 1 1 1	EOX

★ nnnn = 0 ~ 15: channel number (channel to receive exclusive messages) specified by parameter 84.

(d) DATA LOAD (DATA DUMP)

BYTE	DESCRIPTION
1 1 1 1 0 0 0 0	EXCLUSIVE STATUS
0 1 0 0 0 0 1 0	KORG ID 42H
0 0 1 1 n n n n	FORMAT ID 3*H (* = ch) (NOTE 5)
0 0 0 0 0 0 1 1	DW-8000 ID 03H
0 1 0 0 0 0 0 0	DATA DUMP 40H
0 v v v v v v v	DATA 51 BYTES (See DW-8000 BIT MAP)
0 v v v v v v v	
1 1 1 1 0 1 1 1	EOX

★ nnnn = 0 ~ 15: channel number (channel to receive exclusive messages) specified by parameter 84.

(e) PARAMETER CHANGE

BYTE	DESCRIPTION
1 1 1 1 0 0 0 0	EXCLUSIVE STATUS
0 1 0 0 0 0 1 0	KORG ID 42H
0 0 1 1 n n n n	FORMAT ID 3*H (* = ch) (NOTE 5)
0 0 0 0 0 0 1 1	DW-8000 ID 03H
0 1 0 0 0 0 0 1	PARAMETER CHANGE 41H
0 v v v v v v v	PARAMETER OFFSET (See DW-8000 BIT MAP)
0 v v v v v v v	PARAMETER VALUE (See DW-8000 BIT MAP)
1 1 1 1 0 1 1 1	EOX

★ nnnn = 0 ~ 15: channel number (channel receive exclusive messages) specified by parameter 84.

NOTE: 5. Messages with channel numbers different from those specified by parameter 84 are ignored. (This has no relation to OMNI mode setting.)

3. SYSTEM EXCLUSIVE MESSAGE REFERENCE

1. DW-8000 Bit map

PARAMETER OFFSET	PARAMETER VALUE							
	b7	b6	b5	b4	b3	b2	b1	b0
0	0	0	0	0	0	0	OSC 1 OCTAVE	
1	0	0	0	0	OSC 1 WAVE FORM			
2	0	0	0	OSC 1 LEVEL				
3	0	0	0	0	0	0	AUTO BEND SELECT	
4	0	0	0	0	0	0	0	A. BEND MODE
5	0	0	0	A. BEND TIME				
6	0	0	0	A. BEND INTENSITY				
7	0	0	0	0	0	0	OSC 2 OCTAVE	
8	0	0	0	0	OSC 2 WAVE FORM			
9	0	0	0	OSC 2 LEVEL				
10	0	0	0	0	0	INTERVAL		
11	0	0	0	0	0	DETUNE		
12	0	0	0	NOISE LEVEL				
13	0	0	0	0	0	0	ASSIGN MODE	
14	0	0	PARAMETER NO. MEMORY					
15	0	0	CUTOFF					
16	0	0	0	RESONANCE				
17	0	0	0	0	0	0	KBD. TRACK	
18	0	0	0	0	0	0	0	POLARITY
19	0	0	0	EG. INTENSITY				
20	0	0	0	VCF ATTACK				
21	0	0	0	VCF DECAY				
22	0	0	0	VCF BREAK. P				
23	0	0	0	VCF SLOPE				
24	0	0	0	VCF SUSTAIN				
25	0	0	0	VCF RELEASE				
26	0	0	0	0	0	VCF VELOCITY SENS		
27	0	0	0	VCA ATTACK				
28	0	0	0	VCA DECAY				
29	0	0	0	VCA BREAK. P				
30	0	0	0	VCA SLOPE				
31	0	0	0	VCA SUSTAIN				
32	0	0	0	VCA RELEASE				
33	0	0	0	0	0	VCA VELOCITY SENS		
34	0	0	0	0	0	0	MG WAVE FORM	
35	0	0	0	MG FREQUENCY				
36	0	0	0	MG DELAY				
37	0	0	0	MG OSC				

PARAMETER OFFSET	PARAMETER VALUE							
	b7	b6	b5	b4	b3	b2	b1	b0
38	0	0	0	MG VCF				
38	0	0	0	0	BEND OSC			
40	0	0	0	0	0	0	0	BEND VCF
41	0	0	0	0	0	DELAY TIME		
42	0	0	0	0	DELAY FACTOR			
43	0	0	0	0	DELAY FEEDBACK			
44	0	0	0	DELAY FREQUENCY				
45	0	0	0	DELAY INTENSITY				
46	0	0	0	0	DELAY EFFECT LEVEL			
47	0	0	0	PORTAMENTO				
48	0	0	0	0	0	0	AFTER T. OSC MG	
49	0	0	0	0	0	0	AFTER T. VCF	
50	0	0	0	0	0	0	AFTER T. VCA	

2. DW-8000 Bit map and corresponding parameter values

PARAMETER NAME	PARAMETER OFFSET	BIT	CORRESPONDING PANEL VALUE	PARAMETER NUMBER
OSC 1 OCTAVE	0	b1 – b0	00 = 16 01 = 8 10 = 4 11 = INHIBIT	11
OSC 1 WF	1	b3 – b0	0000 – 1111 = 1 – 16	12
OSC 1 LEVEL	2	b4 – b0	00000 – 11111 = 0 – 31	13
A. B. SELECT	3	b1 – b0	00 = OFF 01 = OSC1 10 = OSC2 11 = BOTH	14
A. B. MODE	4	b0	0 = UP 1 = DOWN	15
A. B. TIME	5	b4 – b0	00000 – 11111 = 0 – 31	16
A. B. INT.	6	b4 – b0	00000 – 11111 = 0 – 31	17
OSC 2 OCTAVE	7	b1 – b0	00 = 16 01 = 8 10 = 4 11 = INHIBIT	21
OSC 2 WF	8	b3 – b0	0000 – 1111 = 1 – 16	22
OSC 2 LEVEL	9	b4 – b0	00000 – 11111 = 0 – 31	23
OSC2 INTERVAL	10	b2 – b0	000 = 1 001 = –3 010 = 3 011 = 4 100 = 5 101 – 111 = INHIBIT	24
OSC 2 DETUNE	11	b2 – b0	000 – 110 = 0 – 6 111 = INHIBIT	25
NOISE LEVEL	12	b4 – b0	00000 – 11111 = 0 – 31	26
CUTOFF	15	b5 – b0	000000 – 111111 = 0 – 63	31
RESONANCE	16	b4 – b0	00000 – 11111 = 0 – 31	32
KBD TRACK	17	b1 – b0	00 = (0) 01 = 1(1/4) 10 = 2(1/2) 11 = 3(1)	33
POLARITY	18	b0	0 = 1(⎍) 1 = 2(⎍)	34
VCF EG INT.	19	b4 – b0	00000 – 11111 = 0 – 31	35
VCF ATTACK	20	b4 – b0	00000 – 11111 = 0 – 31	41
VCF DECAY	21	b4 – b0	00000 – 11111 = 0 – 31	42
VCF BREAK P.	22	b4 – b0	00000 – 11111 = 0 – 31	43

PARAMETER NAME	PARAMETER OFFSET	BIT	CORRESPONDING PANEL VALUE	PARAMETER NUMBER
VCF SLOPE	23	b4 – b0	00000 – 11111 = 0 – 31	44
VCF SUSTAIN	24	b4 – b0	00000 – 11111 = 0 – 31	45
VCF RELEASE	25	b4 – b0	00000 – 11111 = 0 – 31	46
VCF V. SENS	26	b2 – b0	000 – 111 = 0 – 7	47
VCA ATTACK	27	b4 – b0	00000 – 11111 = 0 – 31	51
VCA DECAY	28	b4 – b0	00000 – 11111 = 0 – 31	52
VCA BREAK P.	29	b4 – b0	00000 – 11111 = 0 – 31	53
VCA SLOPE	30	b4 – b0	00000 – 11111 = 0 – 31	54
VCA SUSTAIN	31	b4 – b0	00000 – 11111 = 0 – 31	55
VCA RELEASE	32	b4 – b0	00000 – 11111 = 0 – 31	56
VCA V. SENS	33	b2 – b0	000 – 111 = 0 – 7	57
MG WAVE FORM	34	b1 – b0	0 = 1(⩘) 1 = 2(◺) 2 = 3(◿) 3 = 4(⎍)	61
MG FREQUENCY	35	b4 – b0	00000 – 11111 = 0 – 31	62
MG DELAY	36	b4 – b0	00000 – 11111 = 0 – 31	63
MG OSC	37	b4 – b0	00000 – 11111 = 0 – 31	64
MG VCF	38	b4 – b0	00000 – 11111 = 0 – 31	65
BEND OSC	39	b3 – b0	0000 – 1100 = 0 – 12 1101 – 1111 = INHIBIT	66
BEND VCF	40	b0	0 = 0(OFF) 1 = 1(ON)	67
DELAY TIME	41	b2 – b0	000 – 111 = 0 – 7	71
DELAY FACTOR	42	b3 – b0	0000 – 1111 = 0 – 15	72
D. FEEDBACK	43	b3 – b0	0000 – 1111 = 0 – 15	73
D. FREQUENCY	44	b4 – b0	00000 – 11111 = 0 – 31	74
D. INTENSITY	45	b4 – b0	00000 – 11111 = 0 – 31	75
D. EFF. LEVEL	46	b3 – b0	0000 – 1111 = 0 – 15	76
PORTAMENTO	47	b4 – b0	00000 – 11111 = 0 – 31	77
A.T. OSC MG	48	b1 – b0	00 – 11 = 0 – 3	81
AFTER T. VCF	49	b1 – b0	00 – 11 = 0 – 3	82
AFTER T. VCA	50	b1 – b0	00 – 11 = 0 – 3	83

PARAMETER NAME	PARAMETER OFFSET	BIT	CORRESPONDING PANEL DISPLAY/MEMORY
ASSIGN MODE	13	b1 – b0	00 = POLY 1 01 = POLY 2 10 = UNISON 1 11 = UNISON 2
PAR. NO. MEMO.	14	b5 – b0	000000-111110 = 0-62 (7, 14, 15, 21, 22, 23, 31, 39, 47, 55, = INHIBIT)

3. DW-8000 can send/receive the following data.

Sending

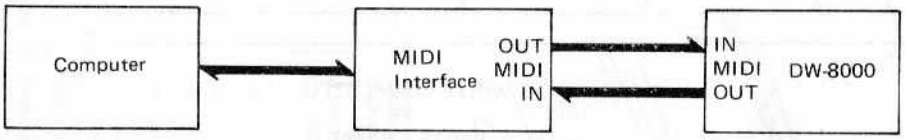
DEVICE ID	: Identifies the equipment. Sent upon receiving a DEVICE REQUEST.
WRITE COMPLETED	: Sent in response to a WRITE REQUEST. This indicates that the PROGRAM WRITE task has been successfully completed.
WRITE ERROR	: Sent in response to a WRITE REQUEST. This indicates that the synth is set to the WRITE DISABLE mode so PROGRAM WRITE task cannot be completed.
DATA SAVE (DATA DUMP)	: In response to a DATA SAVE REQUEST, this sends the data for the sound presently being produced.

Receiving

RECEIVE ID REQUEST	: A request for the equipment's MIDI identification number.
WRITE REQUEST	: A request for the DW-8000 to write data for the present sound to program memory.
DATA SAVE REQUEST	: A request for the DW-8000 to send data for the present sound.
DATA LOAD (DATA DUMP)	: Sound data information. Sound data is entered via the Data Load.
PARAMETER CHANGE	: Used to change parameters of the current sound.

- The DW-8000 can use these system exclusive messages to communicate with a computer equipped with a MIDI interface. (A program to process the exclusive messages is required.)

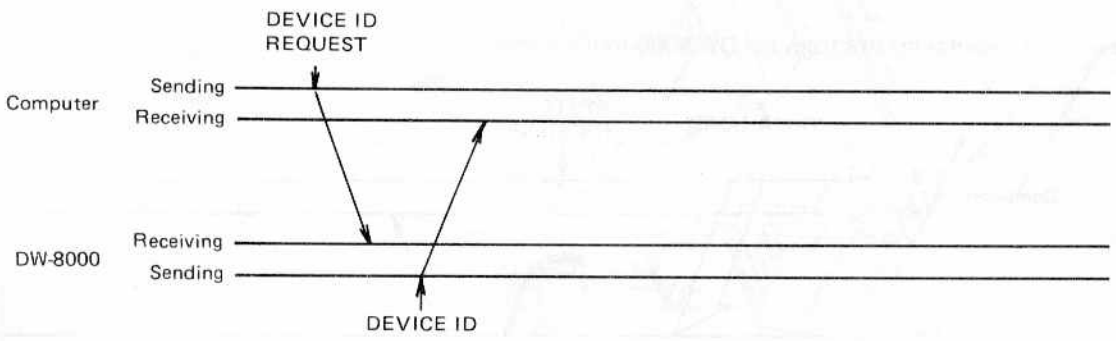
- **Connecting a computer**



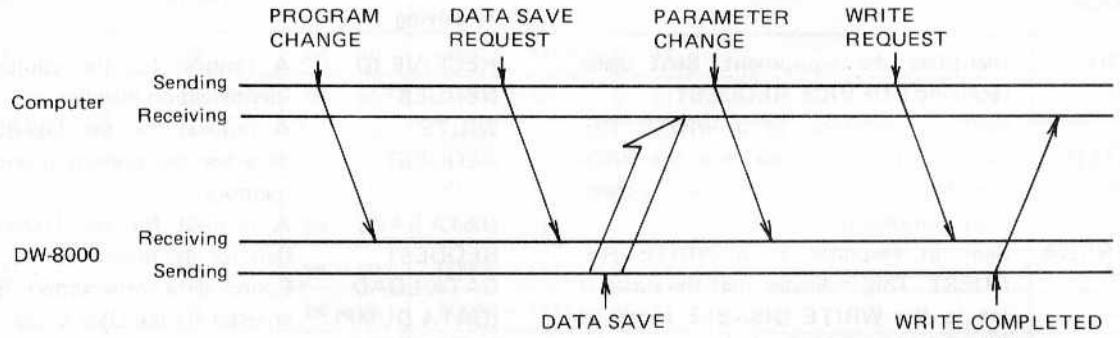
Because each exclusive message for the DW-8000 is specified with a channel designated by parameter 84, the corresponding channel must be used for message transmission from a computer to the DW-8000. A message sent using the incorrect channel will be ignored, regardless of OMNI mode being ON or OFF.
These channels are used to effectively that timbre control could be done independently for each DW-8000 in a system using two or more DW-8000s.

- **Examples of communication with a computer**

(1) To find the ID number for equipment connected to the computer.

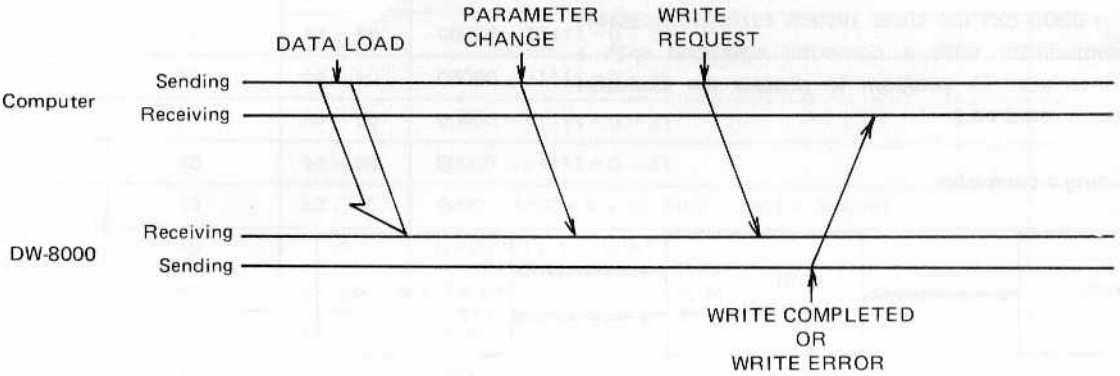


(2) To edit sound data within the DW-8000.

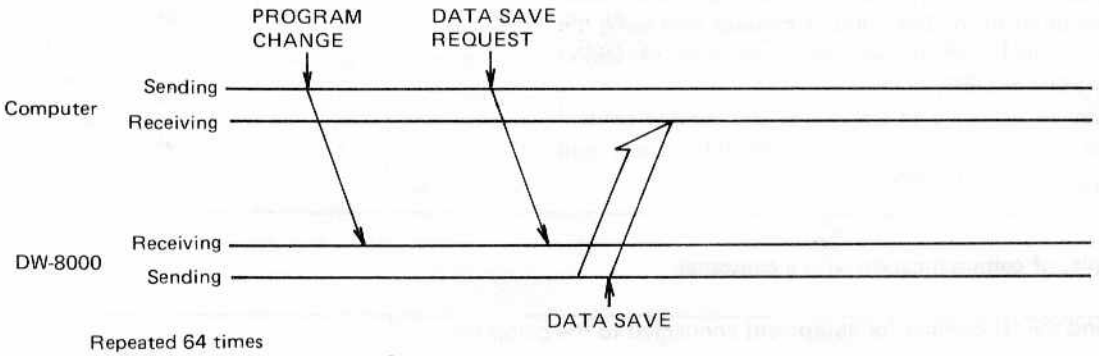


Note: PROGRAM CHANGE is not a SYSTEM EXCLUSIVE message.

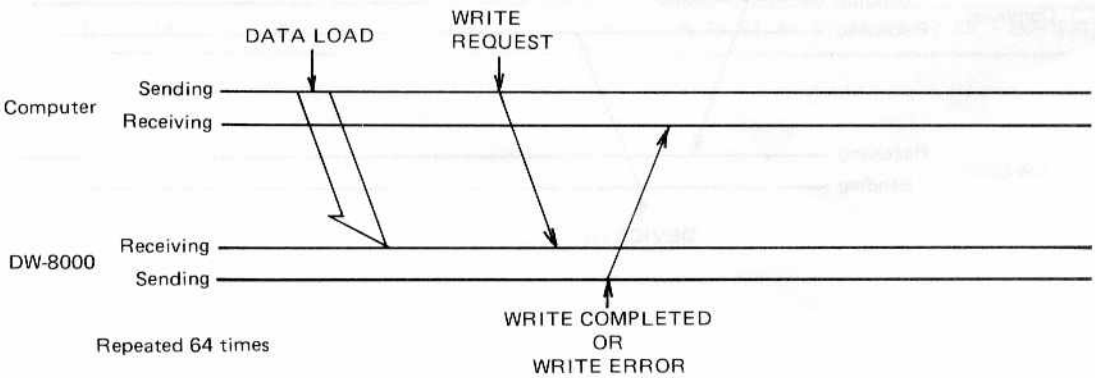
(3) To edit data already available in the computer.



(4) To load all 64 sound programs from the computer to the DW-8000.



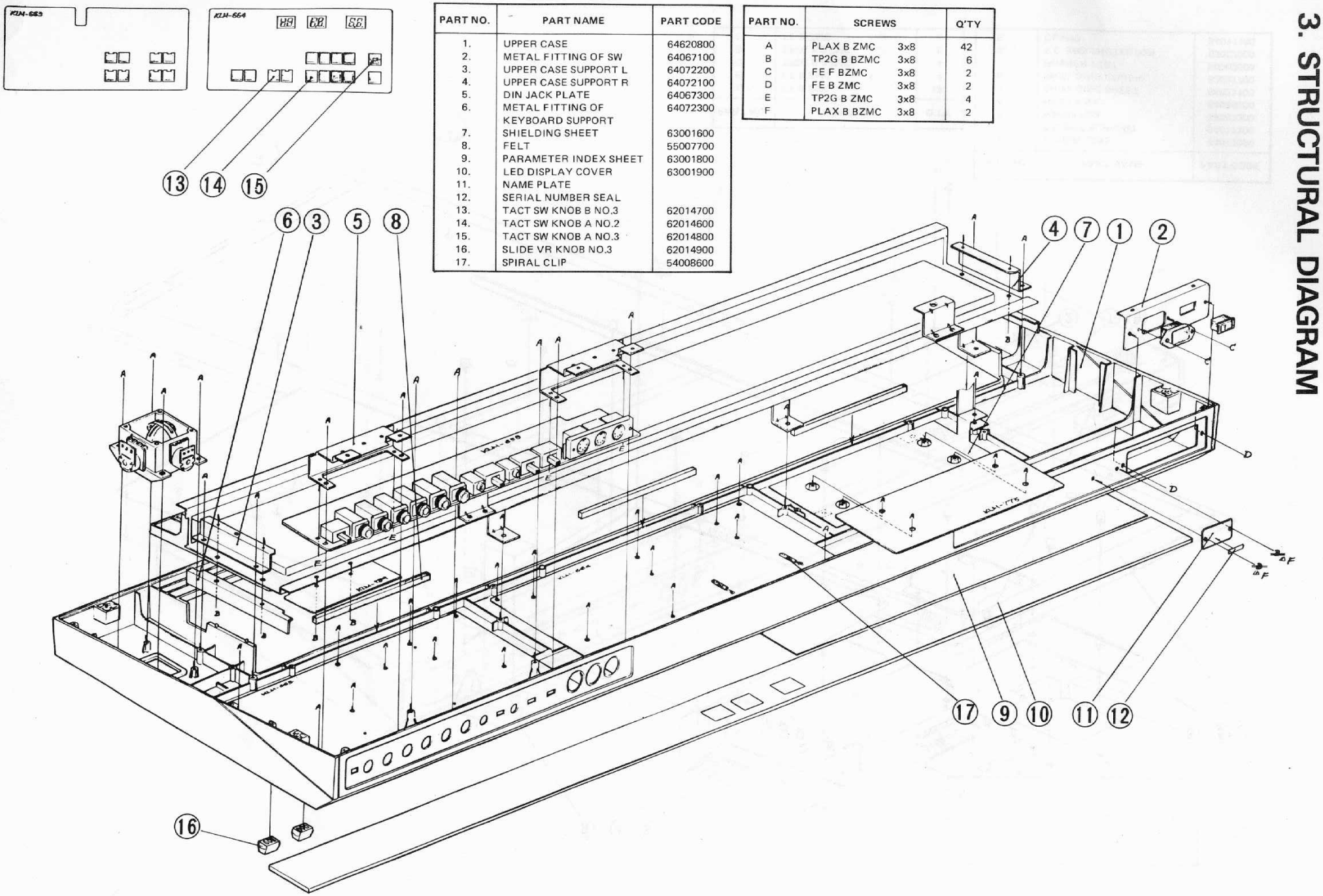
(5) To save all 64 sound programs from the DW-8000 to the computer.

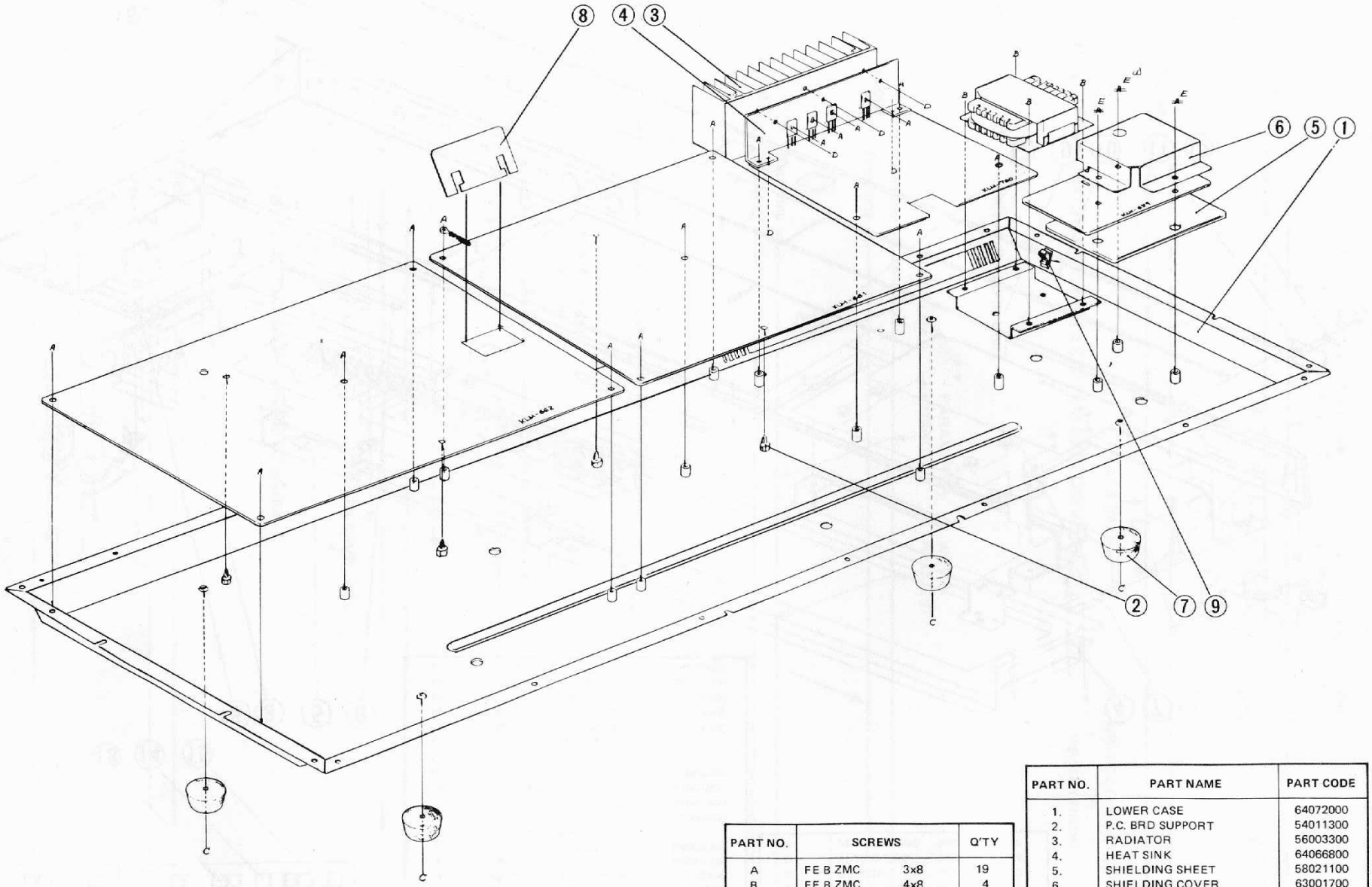


3. STRUCTURAL DIAGRAM

PART NO.	PART NAME	PART CODE
1.	UPPER CASE	64620800
2.	METAL FITTING OF SW	64067100
3.	UPPER CASE SUPPORT L	64072200
4.	UPPER CASE SUPPORT R	64072100
5.	DIN JACK PLATE	64067300
6.	METAL FITTING OF KEYBOARD SUPPORT	64072300
7.	SHIELDING SHEET	63001600
8.	FELT	55007700
9.	PARAMETER INDEX SHEET	63001800
10.	LED DISPLAY COVER	63001900
11.	NAME PLATE	
12.	SERIAL NUMBER SEAL	
13.	TACT SW KNOB B NO.3	62014700
14.	TACT SW KNOB A NO.2	62014600
15.	TACT SW KNOB A NO.3	62014800
16.	SLIDE VR KNOB NO.3	62014900
17.	SPIRAL CLIP	54008600

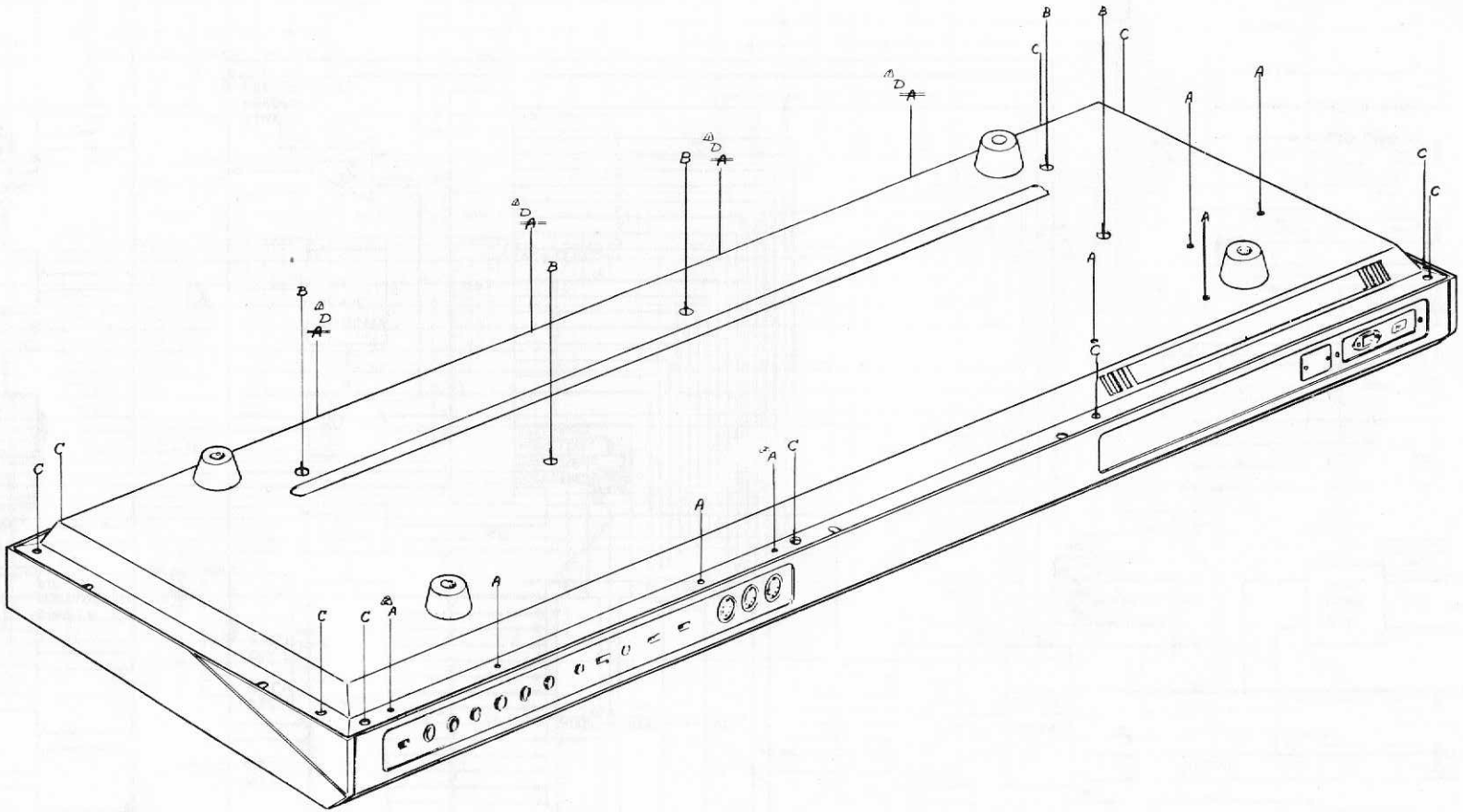
PART NO.	SCREWS		Q'TY
A	PLAX B ZMC	3x8	42
B	TP2G B BZMC	3x8	6
C	FE F BZMC	3x8	2
D	FE B ZMC	3x8	2
E	TP2G B ZMC	3x8	4
F	PLAX B BZMC	3x8	2





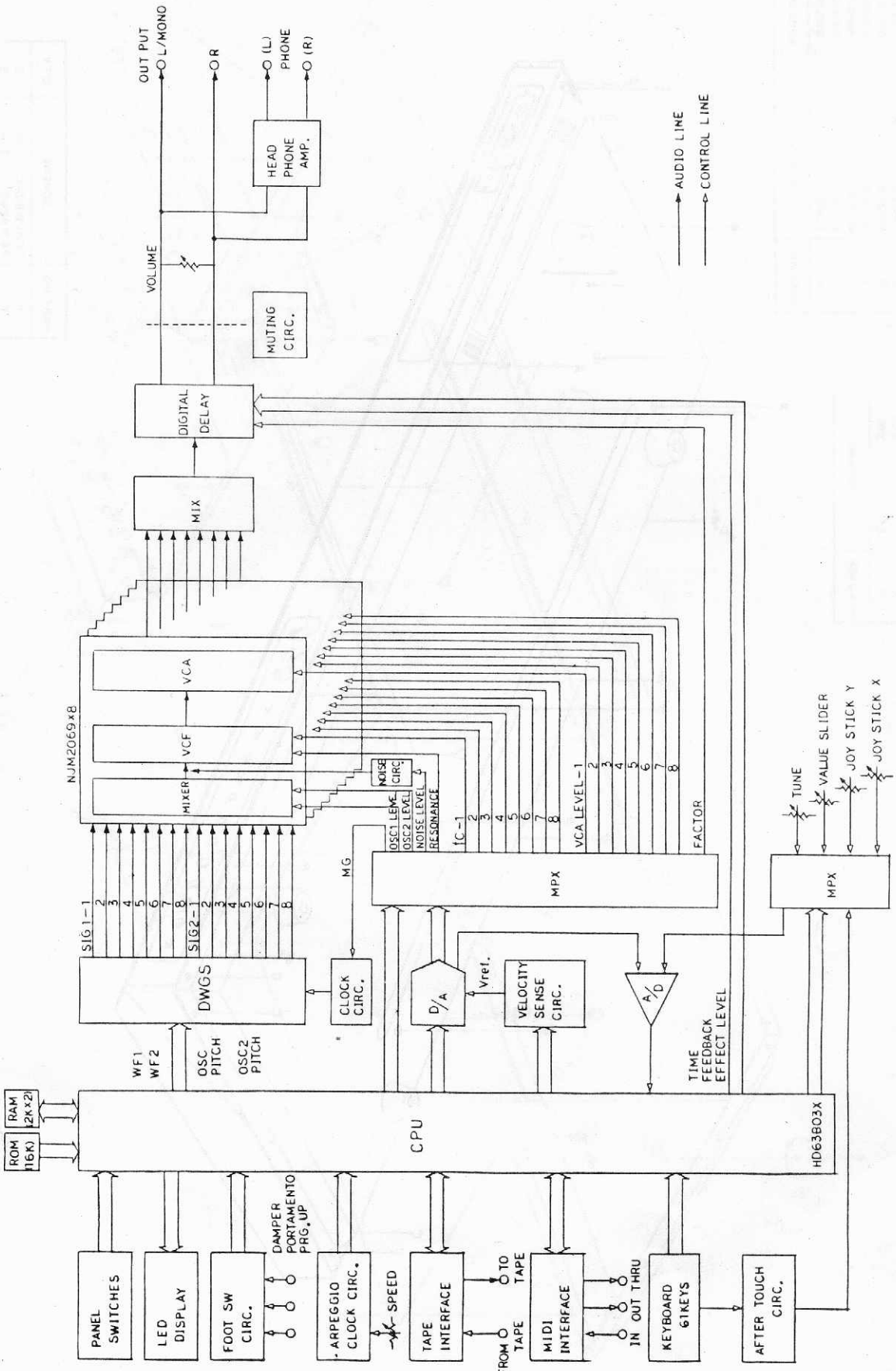
PART NO.	SCREWS		Q'TY
A	FE B ZMC	3x8	19
B	FE B ZMC	4x8	4
C	TP2G B BZMC	3x12	4
D	TP2G B BZMC	3x8	5
E	FE B ZMC	3x6	3

PART NO.	PART NAME	PART CODE
1.	LOWER CASE	64072000
2.	P.C. BRD SUPPORT	54011300
3.	RADIATOR	56003300
4.	HEAT SINK	64066800
5.	SHIELDING SHEET	58021100
6.	SHIELDING COVER	63001700
7.	RUBBER FEET	50009500
8.	P.C. BRD PROTECTOR	63002000
9.	CLAMP	54011100



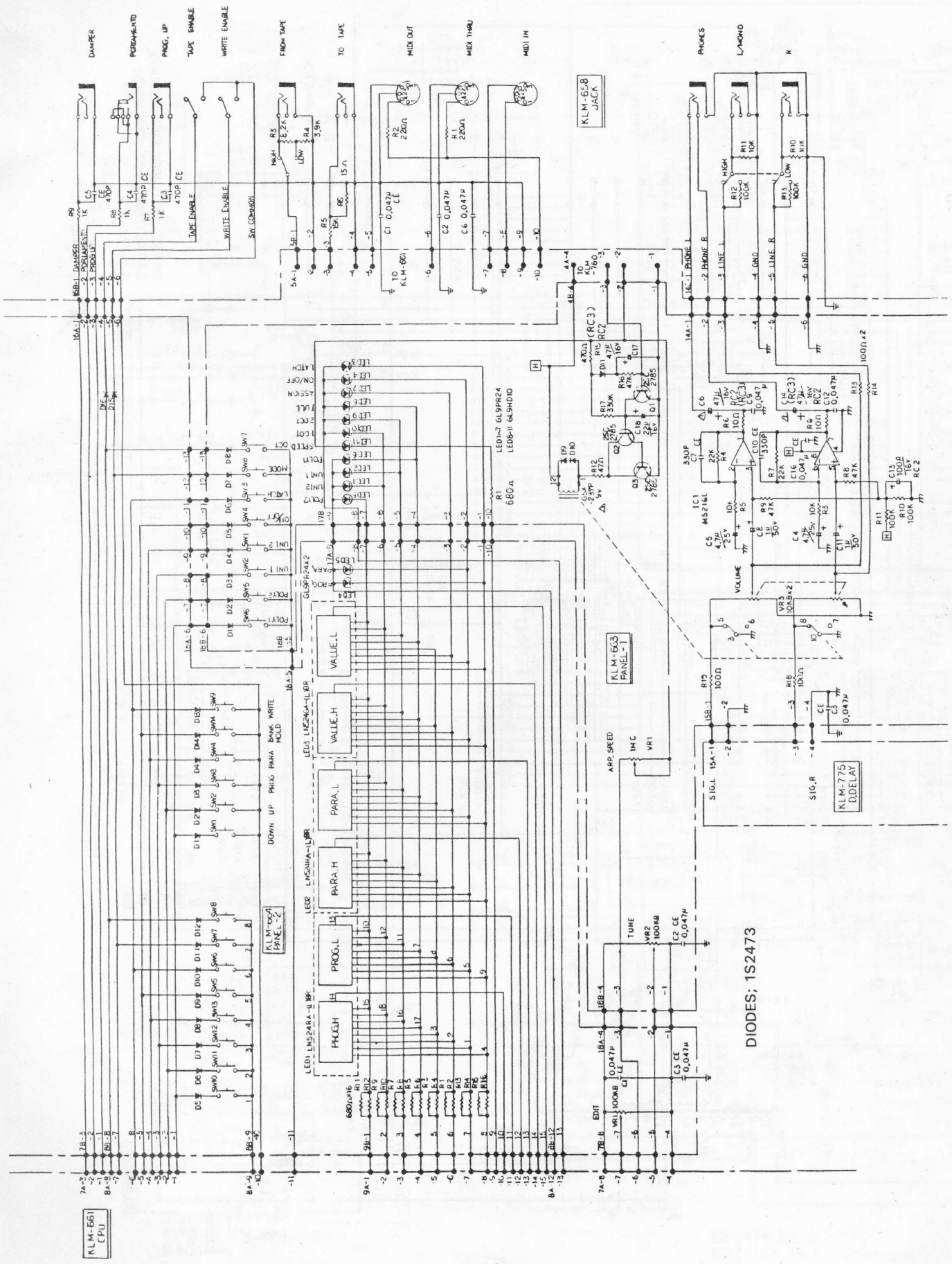
PART NO.	SCREWS		Q'TY
A	TP2G B BZMC	3x8	6
B	FE B BZMC	5x8	5
C	PLAX B BZMC	4x10	10
D	PLAX B BZMC	3x8	4

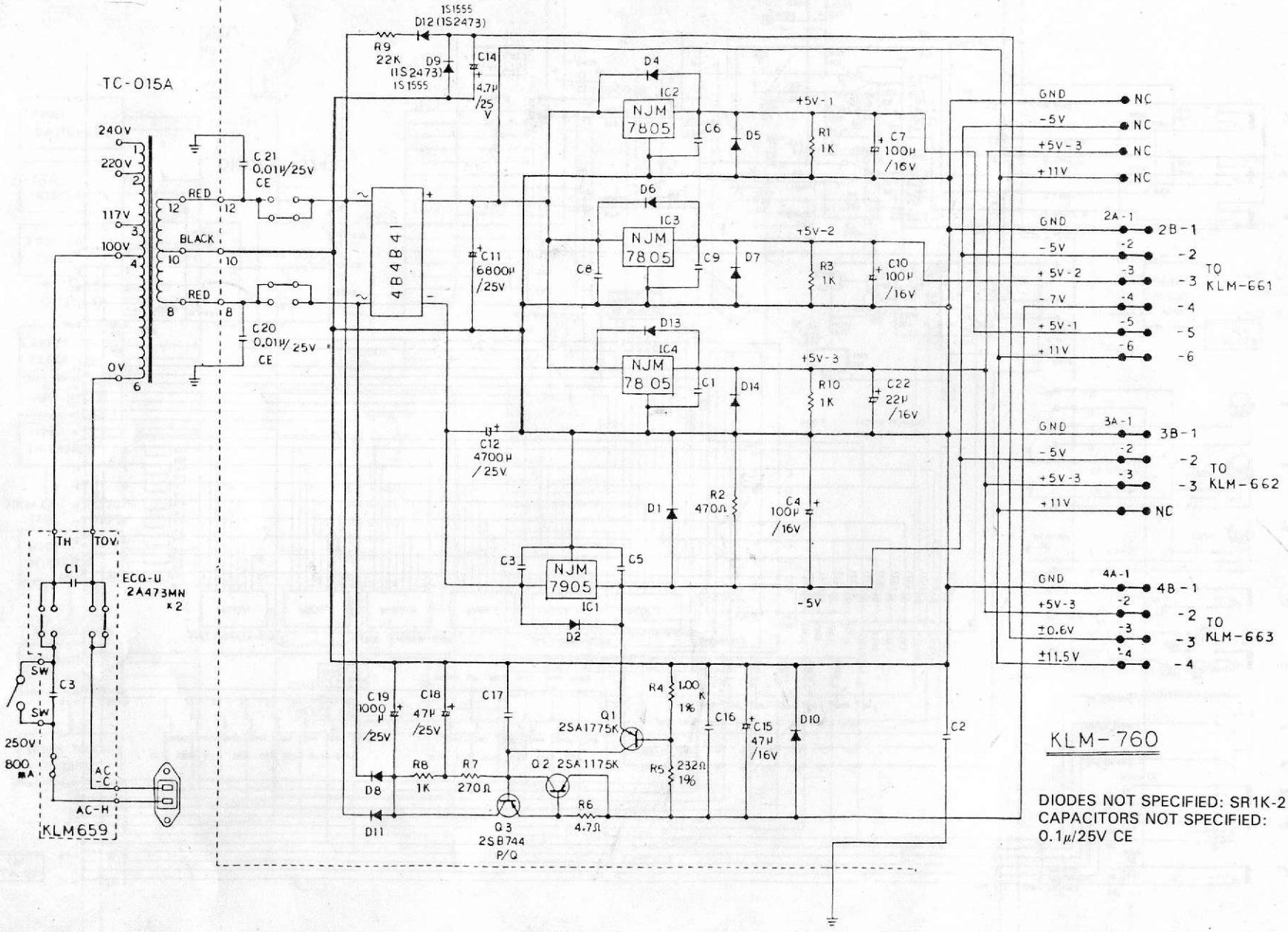
4. BLOCK DIAGRAM

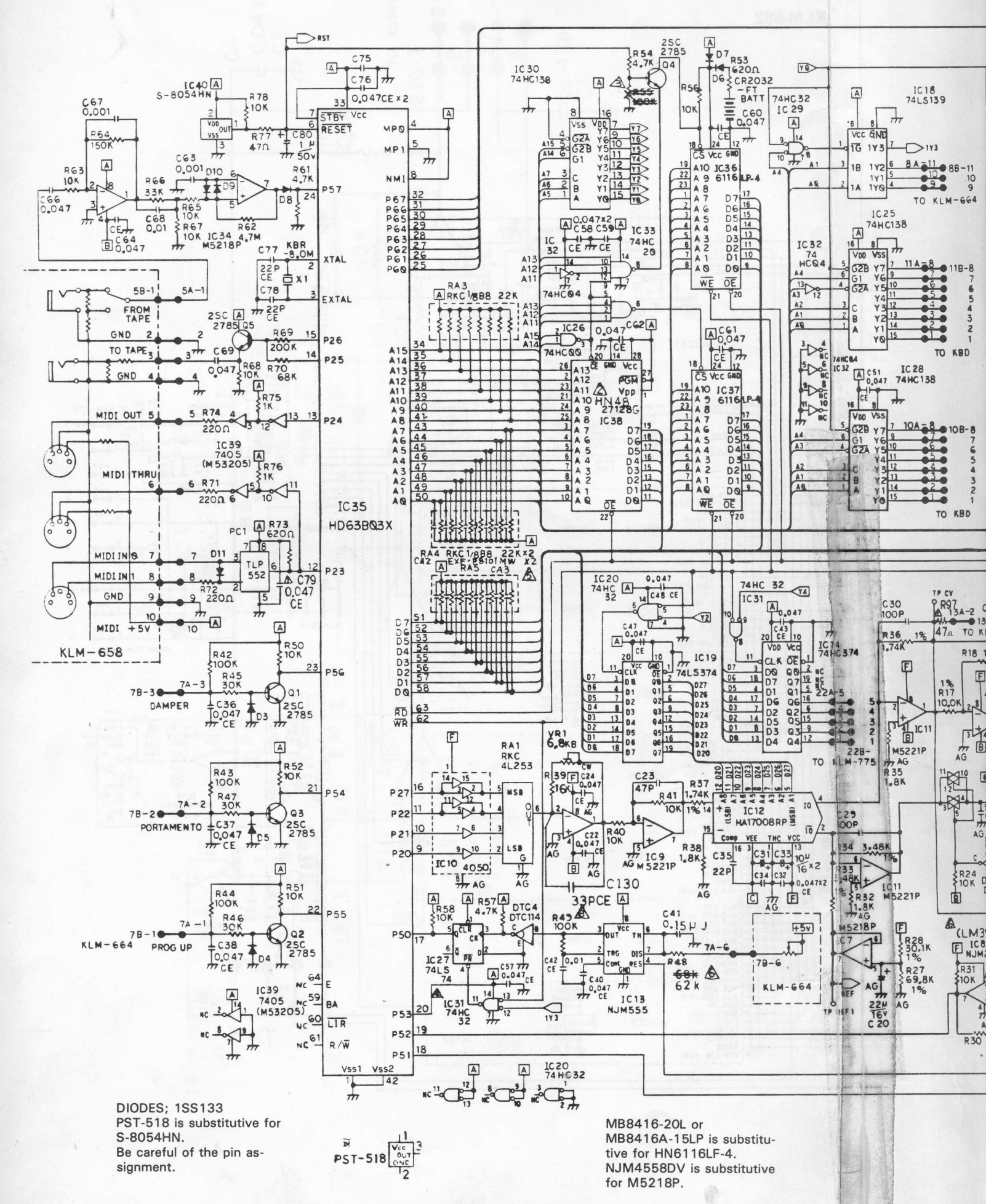


5. CIRCUIT DIAGRAM

KLM-658, 663, 664



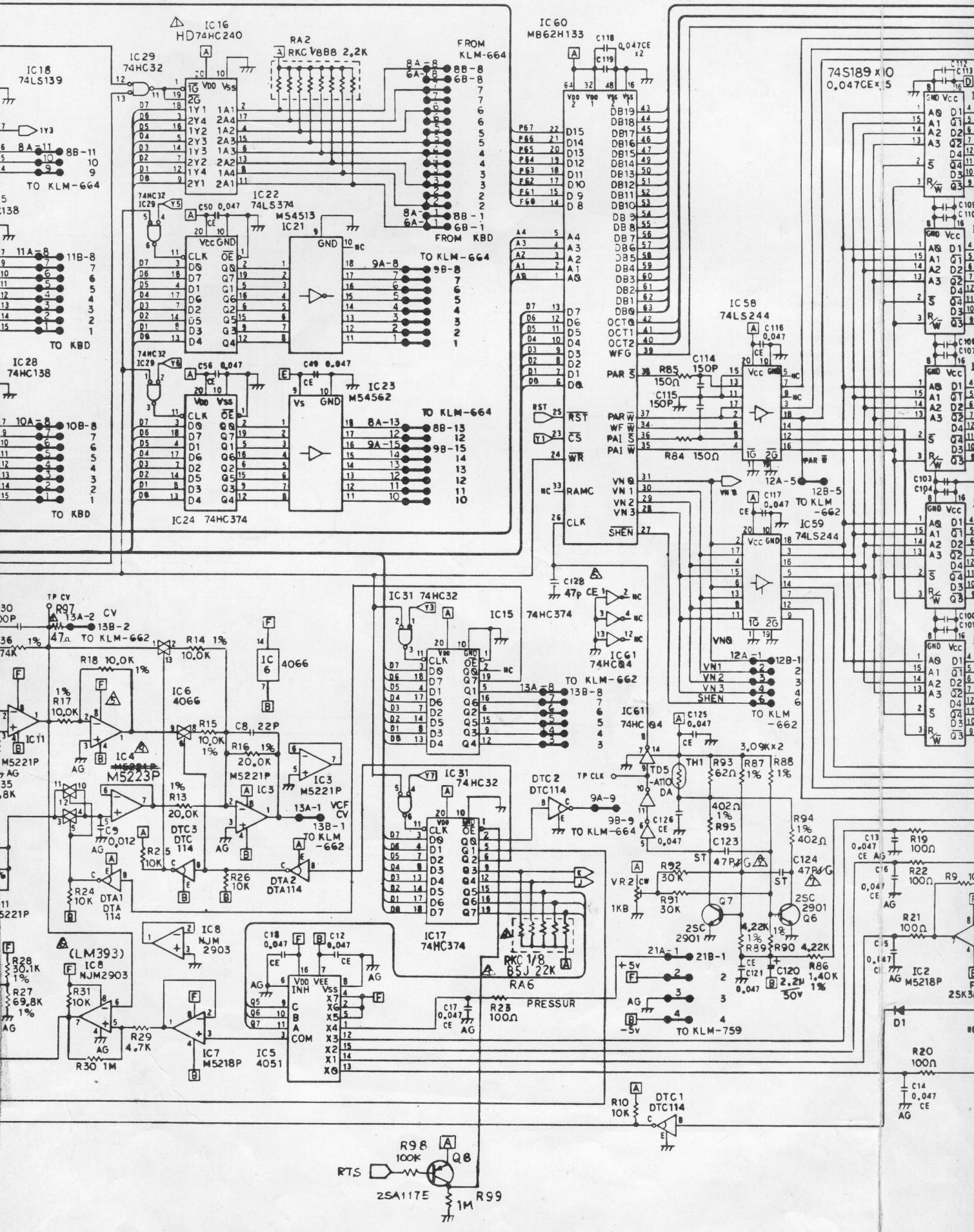

TC-015A
240V
220V
117V
100V
0V
RED
BLACK
RED
C21 0.01μ/25V CE
C20 0.01μ/25V CE
4B4B41
R9 22K
D9 (1S2473)
1S1555
D12 (1S2473)
1S1555
C14 4.7μ/25V
C11 6800μ/25V
C12 4700μ/25V
IC2 NJM 7805
IC3 NJM 7805
IC4 NJM 7805
IC1 NJM 7905
D4
D5
D6
D7
D13
D14
D1
D2
D8
D11
C6
C8
C9
C1
C3
C5
C19 1000μ/25V
C18 47μ/25V
C17
C16
C15 47μ/25V
C2
R1 1K
R3 1K
R10 1K
R2 470Ω
R8 1K
R7 270Ω
R6 4.7Ω
R4 1.00K 1%
R5 232Ω 1%
C7 100μ/16V
C10 100μ/16V
C22 22μ/16V
C4 100μ/16V
+5V-1
+5V-2
+5V-3
-5V
Q1 2SA1775K
Q2 2SA1175K
Q3 2SB744 P/Q
GND
-5V
+5V-3
+11V
NC
2A-1
2B-1
-2
-3
-4
-5
-6
TO KLM-661
-7V
+5V-1
3A-1
3B-1
TO KLM-662
4A-1
4B-1
TO KLM-663
±0.6V
±11.5V
TH
TOV
C1
ECQ-U 2A473MN ×2
SW
SW
C3
250V 800mA
AC-C
AC-H
KLM659
KLM-760
DIODES NOT SPECIFIED: SR1K-2
CAPACITORS NOT SPECIFIED: 0.1μ/25V CE
KLM-659, 760

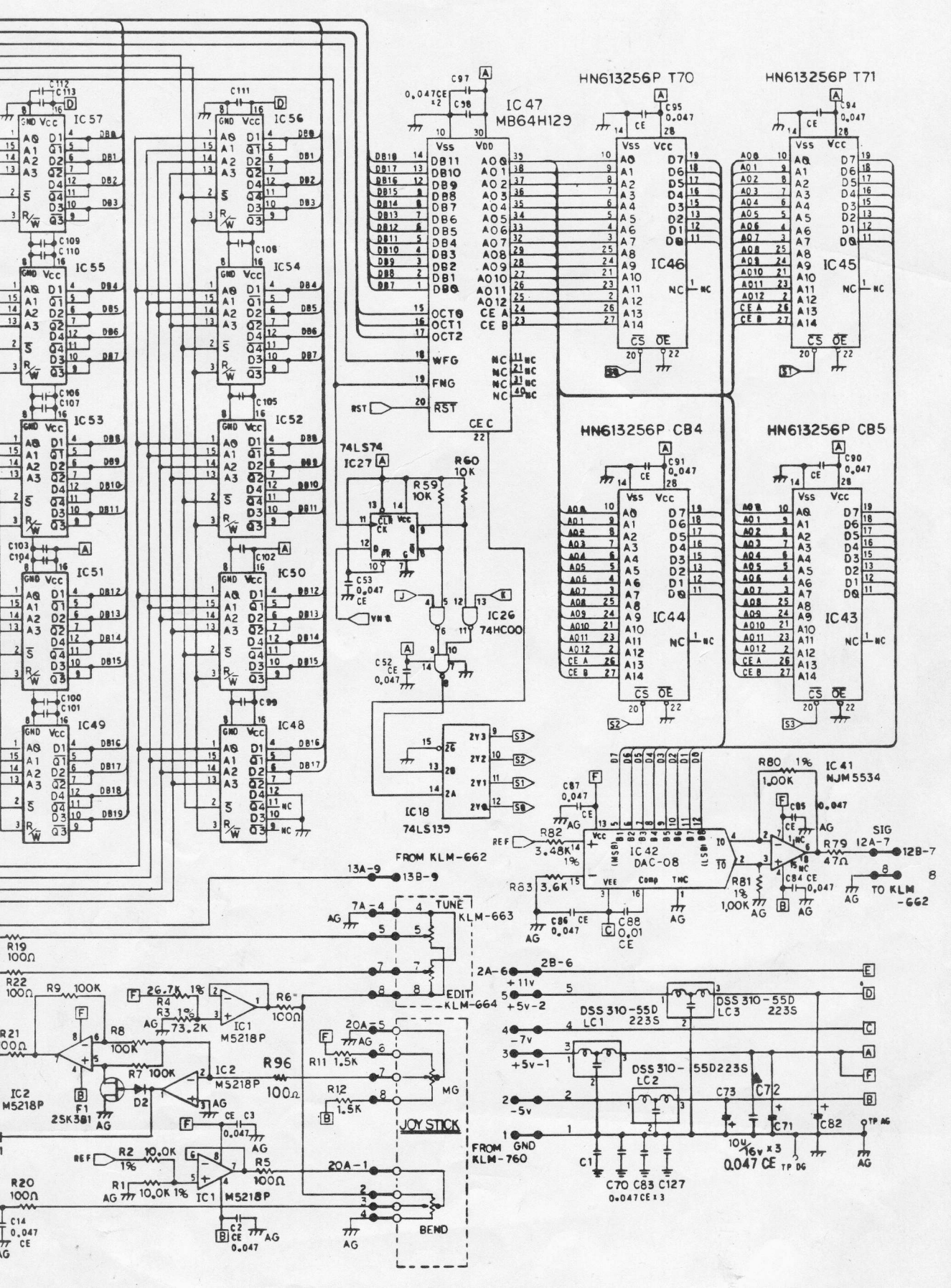


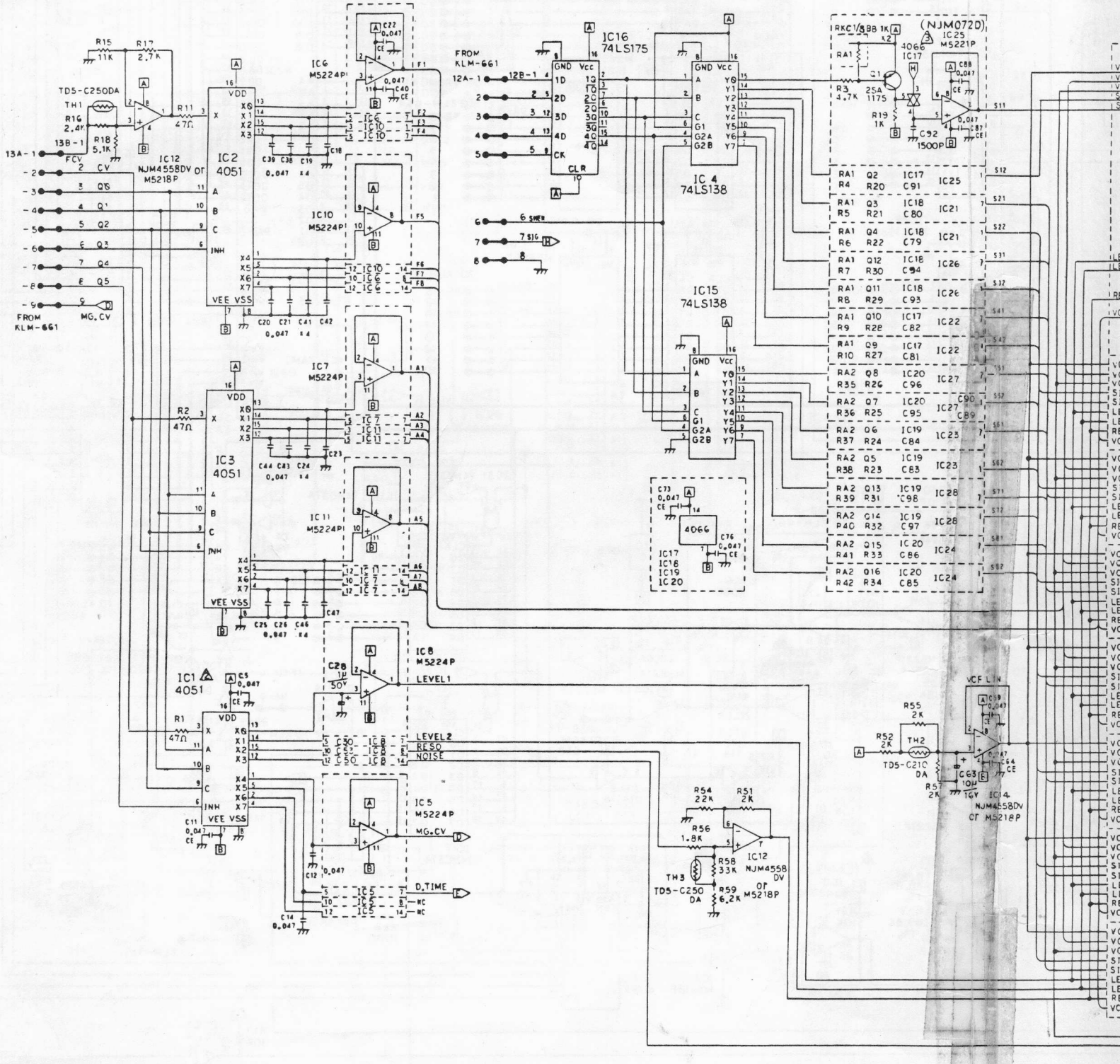
DIODES; 1SS133

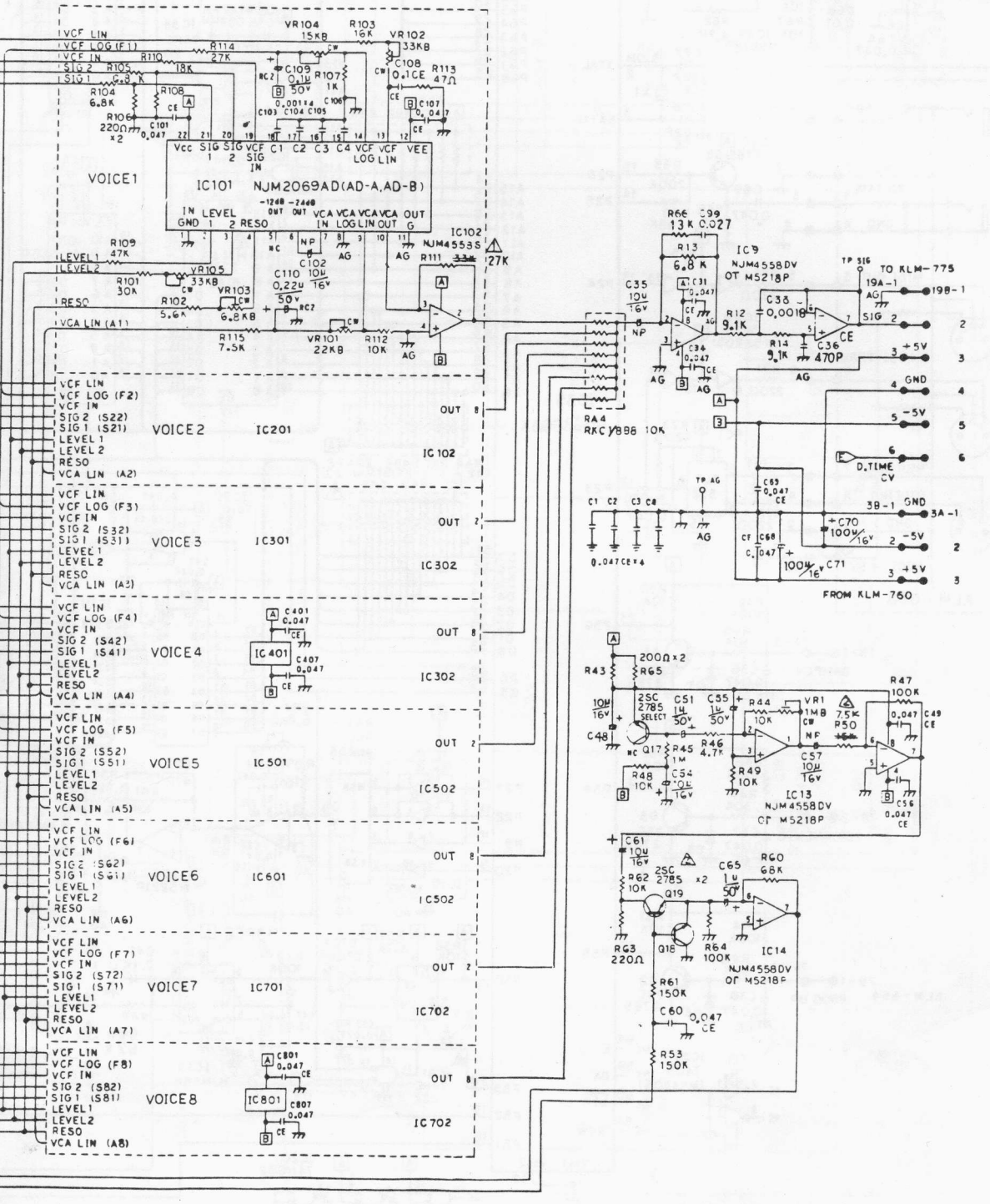
PST-518 is substitutive for S-8054HN.
Be careful of the pin assignment.

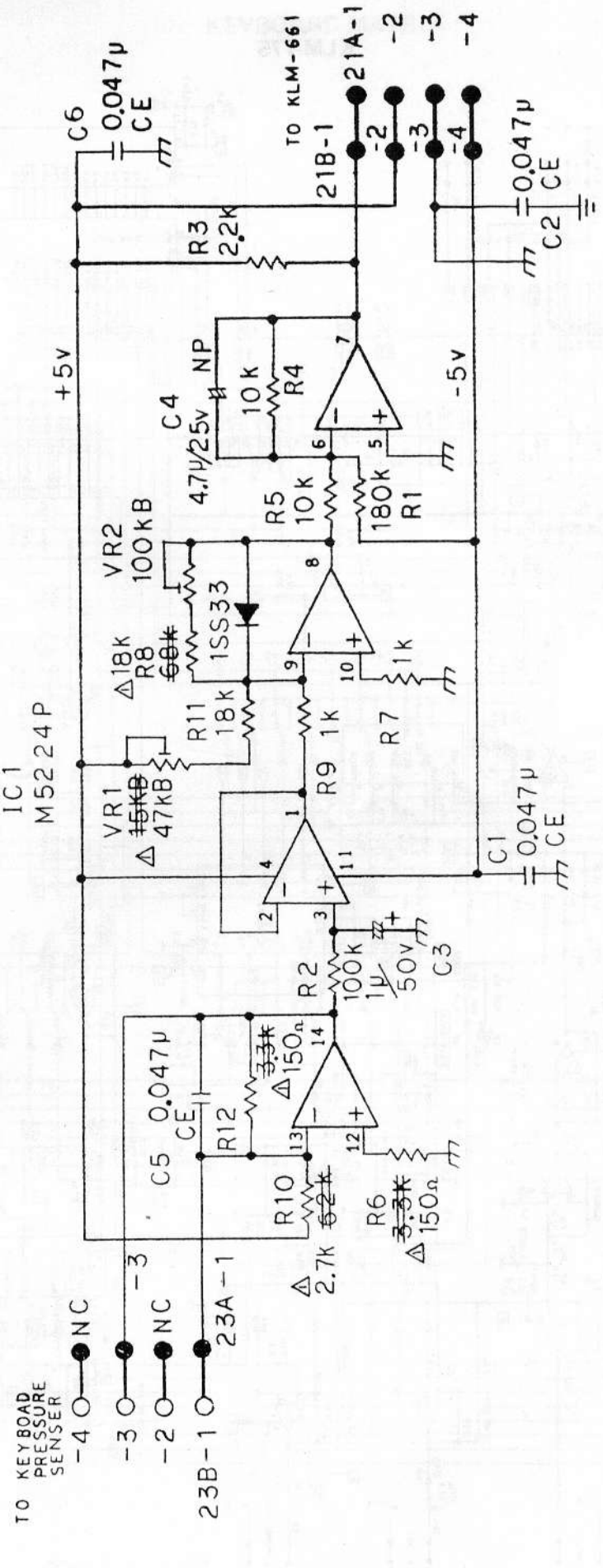
MB8416-20L or MB8416A-15LP is substitutive for HN6116LF-4.
NJM4558DV is substitutive for M5218P.

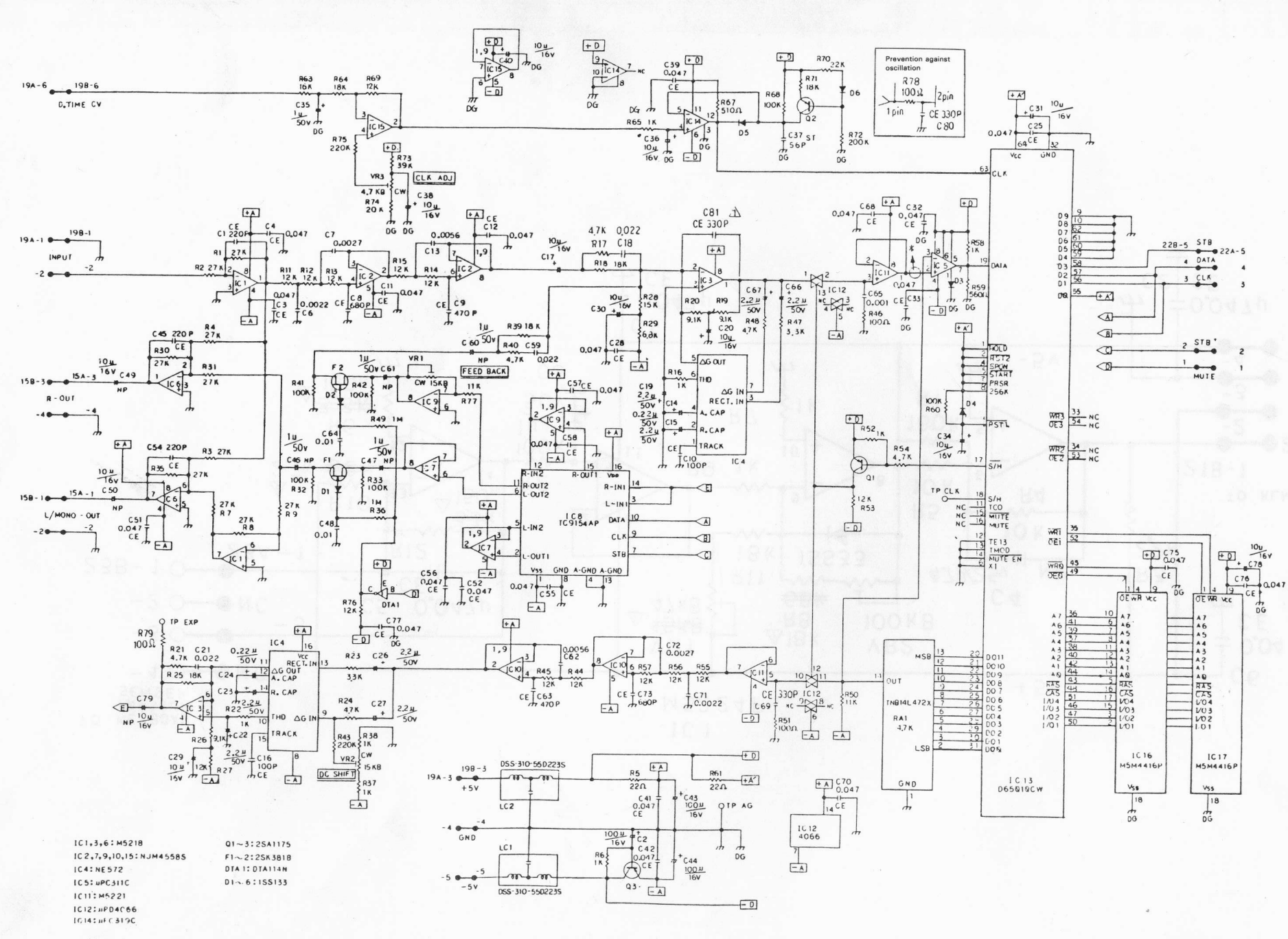

IC16 HD74HC240
IC29 74HC32
RA2 RKC V888 2.2K
FROM KLM-664
IC18 74LS139
TO KLM-664
IC22 74LS374
M54513
IC21
FROM KBD
TO KBD
IC28 74HC138
IC24 74HC374
IC23 M54562
IC60 MB62H133
IC58 74LS244
IC59 74LS244
74S189 x10
0.047CE x5
IC31 74HC32
IC15 74HC374
IC61 74HC04
IC6 4066
IC4 M5223P
IC3 M5221P
IC11 M5221P
IC8 NJM2903
(LM393)
IC7 M5218P
IC5 4051
IC17 74HC374
IC2 M5218P
RKC 1/8 B5J 22K RA6
PRESSURE
TO KLM-662
TO KLM-759
TO KLM -662
TP CV
CV
VCF CV
DTC1 DTC114
DTC2 DTC114
DTC3 DTC 114
DTA1 DTA 114
DTA2 DTA114
TP CLK
RTS
2SA1175
Q8
Q7
Q6
2SC 2901
D1

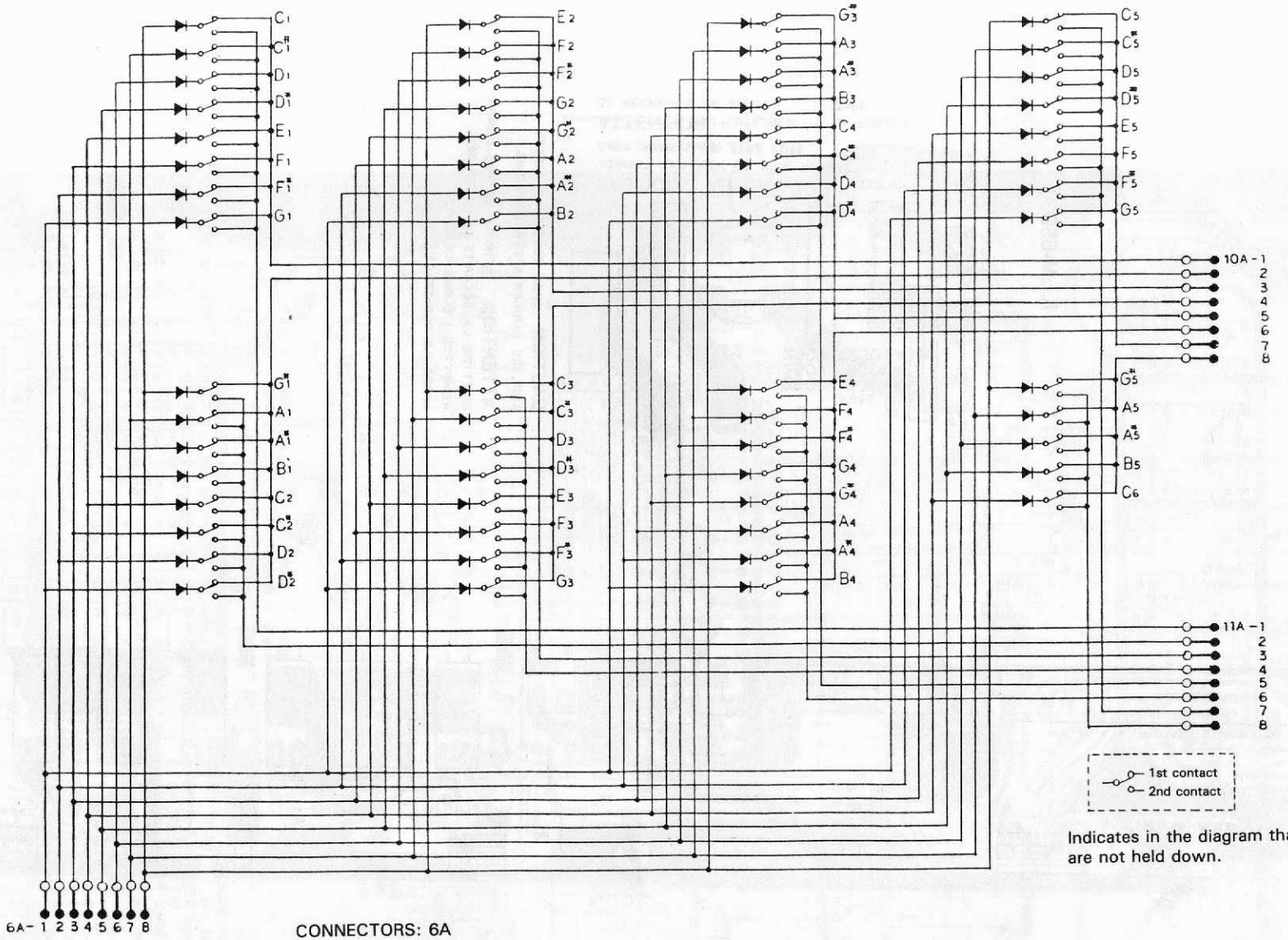

IC57
IC56
IC55
IC54
IC53
IC52
IC51
IC50
IC49
IC48
IC47
MB64H129
HN613256P T70
HN613256P T71
HN613256P C84
HN613256P C85
IC46
IC45
IC44
IC43
74LS74
IC27
IC26
74HC00
IC18
74LS139
IC41
NJM5534
IC42
DAC-08
IC1
IC2
M5218P
2SK381
TUNE
EDIT
JOY STICK
BEND
MG
FROM KLM-662
TO KLM-662
FROM KLM-760
DSS 310-55D 223S
LC1
LC2
LC3
SIG
TP AG
TP DG


IC1 4051
IC2 4051
IC3 4051
IC4 74LS138
IC5 M5224P
IC6 M5224P
IC7 M5224P
IC8 M5224P
IC10 M5224P
IC11 M5224P
IC12 NJM4558DV or M5218P
IC14 NJM4558DV or M5218P
IC15 74LS138
IC16 74LS175
IC17 4066
IC25 M5221P
(NJM072D)
TD5-C250DA
TD5-C210DA
LEVEL1
LEVEL2
RESO
NOISE
MG.CV
D.TIME
FCV
CV
FROM KLM-661
VCF LIN


VOICE1
IC101 NJM2069AD(AD-A,AD-B)
IC102 NJM4558S
VOICE2 IC201
VOICE3 IC301
VOICE4 IC401
VOICE5 IC501
VOICE6 IC601
VOICE7 IC701
VOICE8 IC801
IC9 NJM4558DV OT M5218P
IC13 NJM4558DV OT M5218P
IC14 NJM4558DV OT M5218P
TO KLM-775
FROM KLM-760
D.TIME CV
RA4 RKC4886 10K


TO KEYBOAD PRESSURE SENSER
-4
-3
-2
23B-1
NC
NC
-3
23A-1
IC 1
M5224P
+5v
-5v
C6 0.047μ CE
C2 0.047μ CE
C1 0.047μ CE
C5 0.047μ CE
C4 4.7μ/25v NP
C3 1μ/50v
R3 2.2K
R4 10k
R5 10k
R1 180k
R2 100k
R7 1k
R9 1k
R11 18k
R8 18K 60K
VR2 100kB
1SS33
VR1 15KB 47kB
R12 3.3K 150Ω
R10 6.2K 2.7k
R6 3.3K 150Ω
TO KLM-661
21B-1
21A-1
-2
-3
-4


KLM-775
Prevention against oscillation
R78 100Ω
1pin
2pin
CE 330P
C80
D.TIME CV
CLK ADJ
INPUT
FEED BACK
R-OUT
L/MONO-OUT
TP EXP
DC SHIFT
IC8 TC9154AP
IC13 D65919CW
IC16 M5M4416P
IC17 M5M4416P
IC12 4066
TNB14L472x
RA1 4.7K
DSS-310-550223S
TP AG
IC1,3,6: M5218
IC2,7,9,10,15: NJM4558S
IC4: NE572
IC5: uPC311C
IC11: M5221
IC12: uPD4066
IC14: uPC319C
Q1~3: 2SA1175
F1~2: 2SK381B
DTA1: DTA114N
D1~6: 1SS133



Indicates in the diagram that switches are not held down.

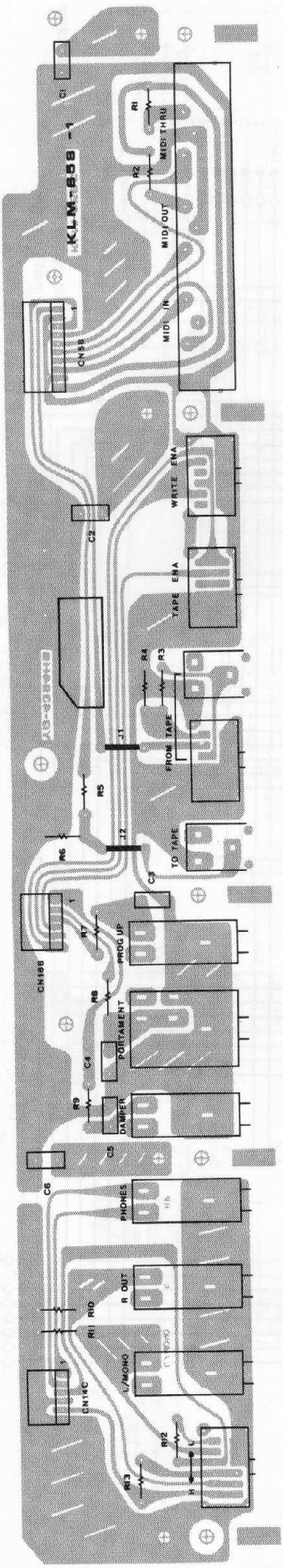
CONNECTORS: 6A
10A
11A

DIODES; 1S1555 or equivalent

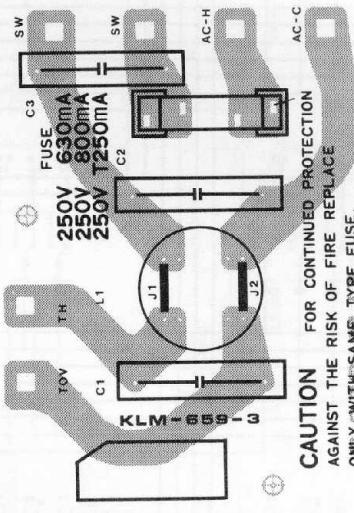
KEYBOARD MATRIX

6. P.C. BOARD

KLM-658

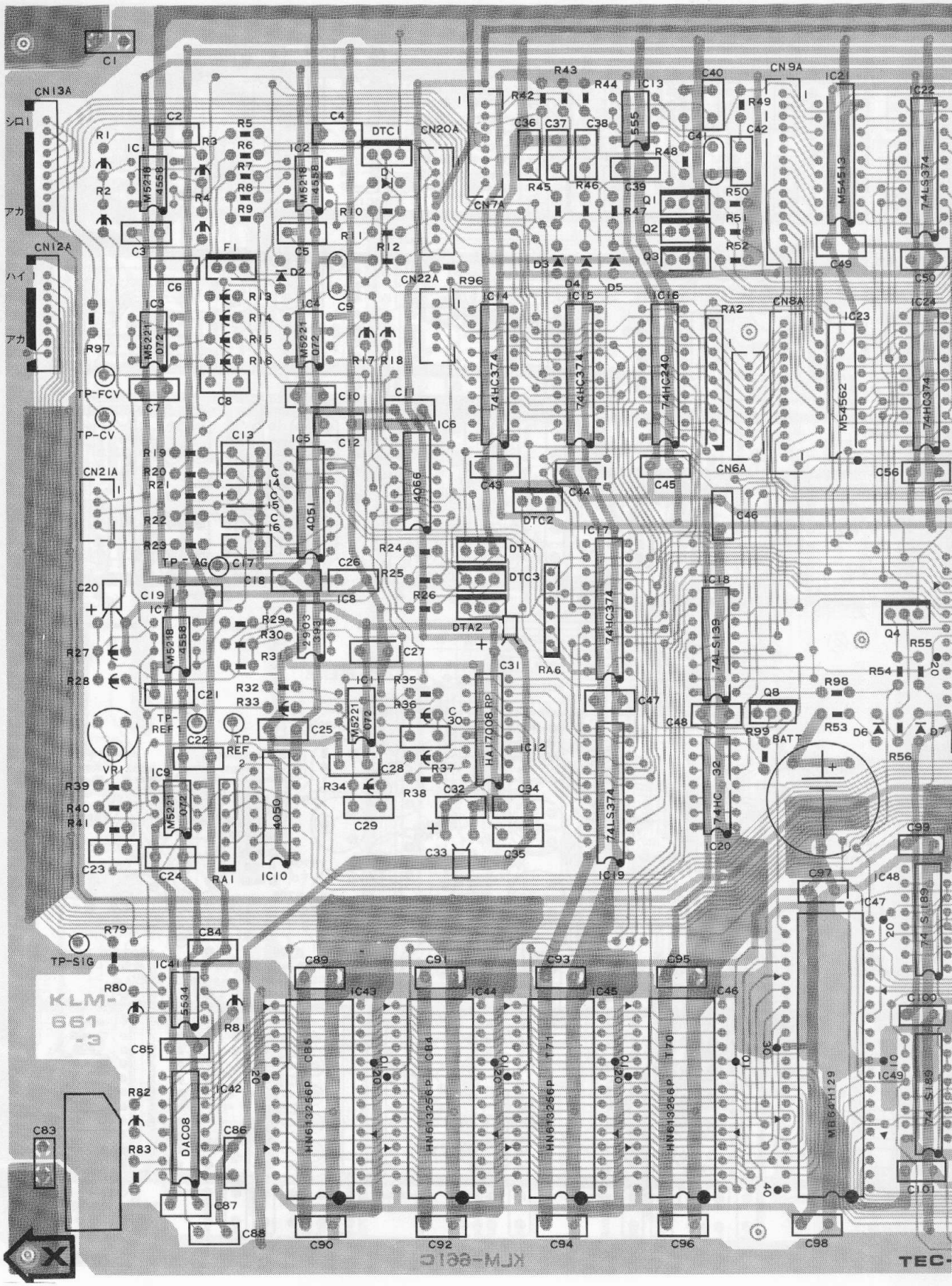


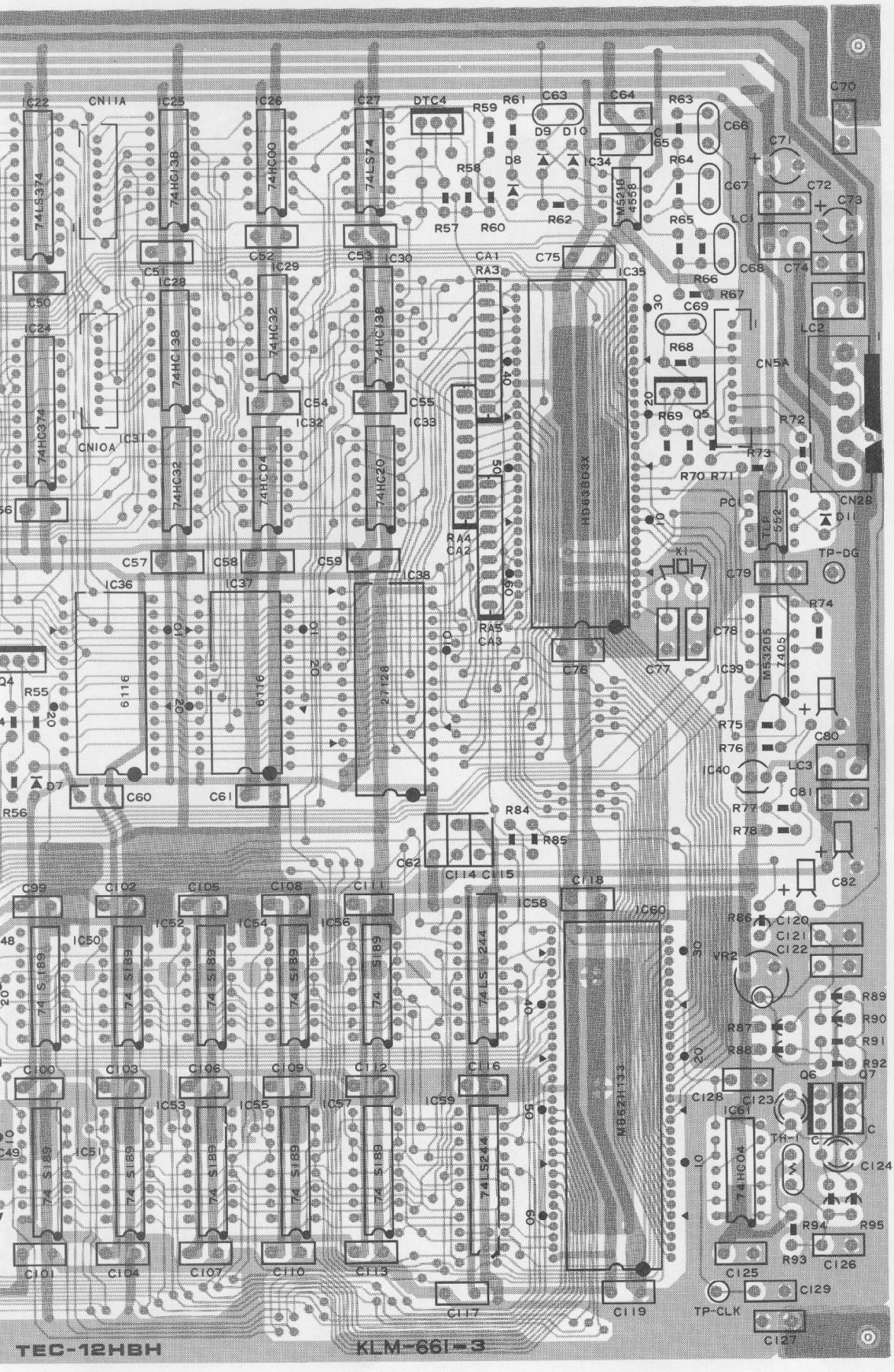
KLM-659

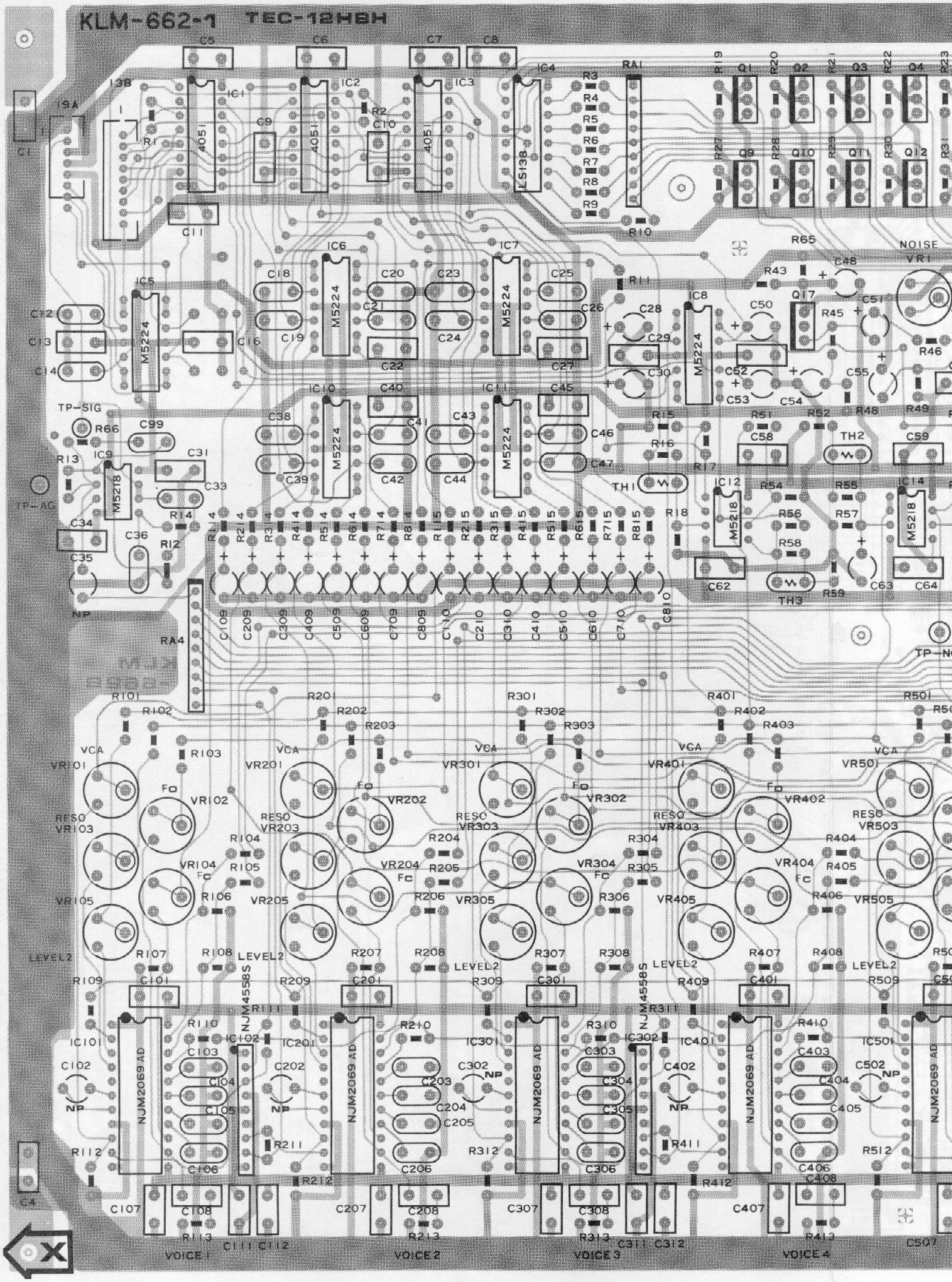


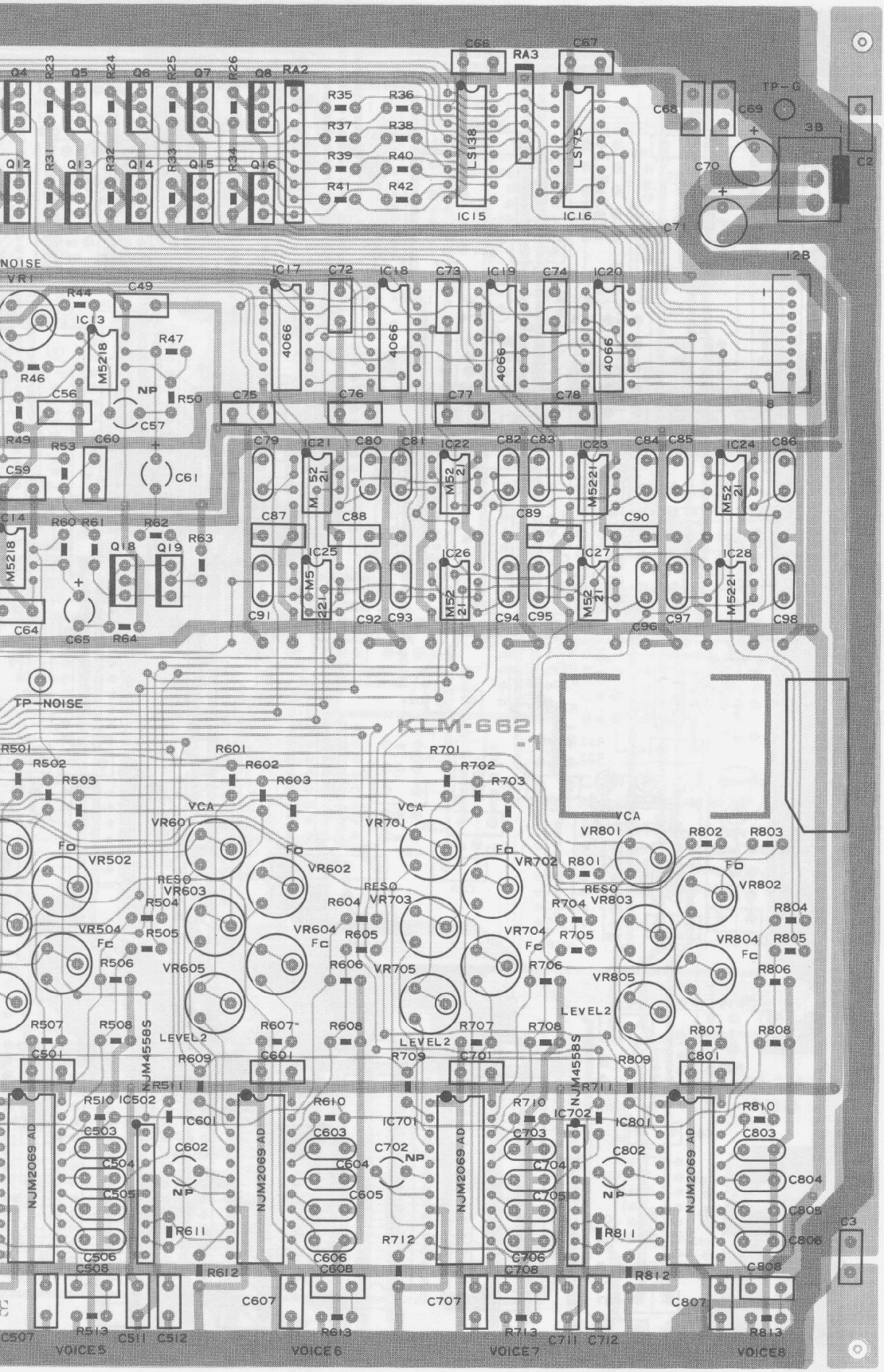
CAUTION FOR CONTINUED SAFETY REPLACE BARRIER AFTER SARVICING.

ATTENTION AFIN DE NE PAS COMPROMETTRE LA SECURITE DE L'APPAREIL, REMETTRE L'ECRAN EN PLACE APRES LE DEPANNAGE.


KLM-661-3
TEC-


TEC-12HBH
KLM-661-3

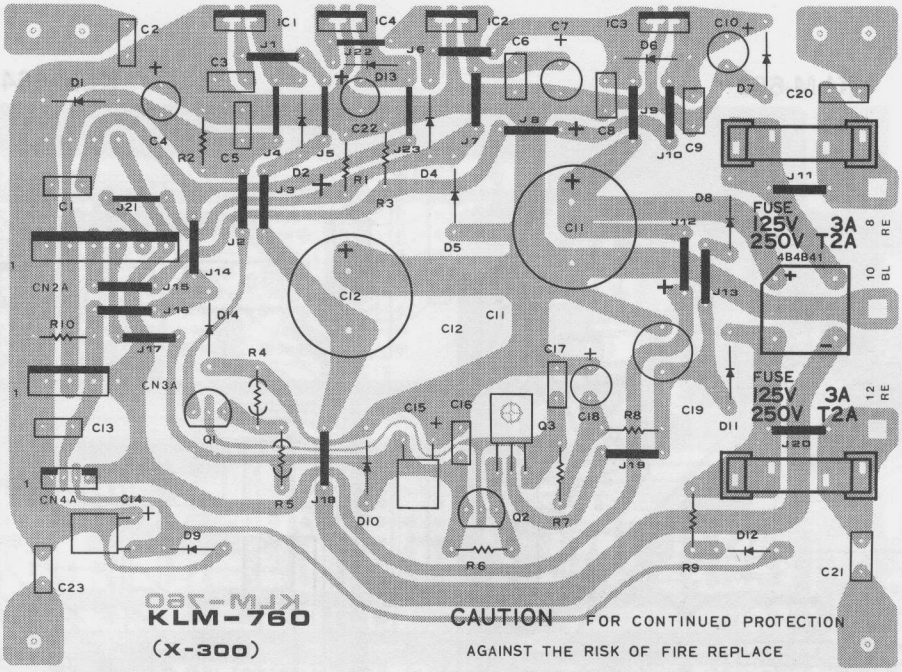

KLM-662-1 TEC-12HBH
VOICE 1
VOICE 2
VOICE 3
VOICE 4
NOISE
TP-SIG
TP-AG
TP-NO
VCA
RESO
LEVEL2
NJM2069 AD
NJM4558S
M5224
M5218
LS138


KLM-662
TP-NOISE
TP-G
NOISE VR1
VOICE5
VOICE6
VOICE7
VOICE8
VCA
VR601
VR602
VR603
VR604
VR605
VR701
VR702
VR703
VR704
VR705
VR801
VR802
VR803
VR804
VR805
VR502
VR504
RESO
Fc
LEVEL2
NP
IC15
IC16
IC17
IC18
IC19
IC20
IC21
IC22
IC23
IC24
IC25
IC26
IC27
IC28
IC502
IC601
IC701
IC801
4066
M5218
M5221
LS138
LS175
NJM2069 AD
NJM4558S
RA2
RA3
TP-NOISE

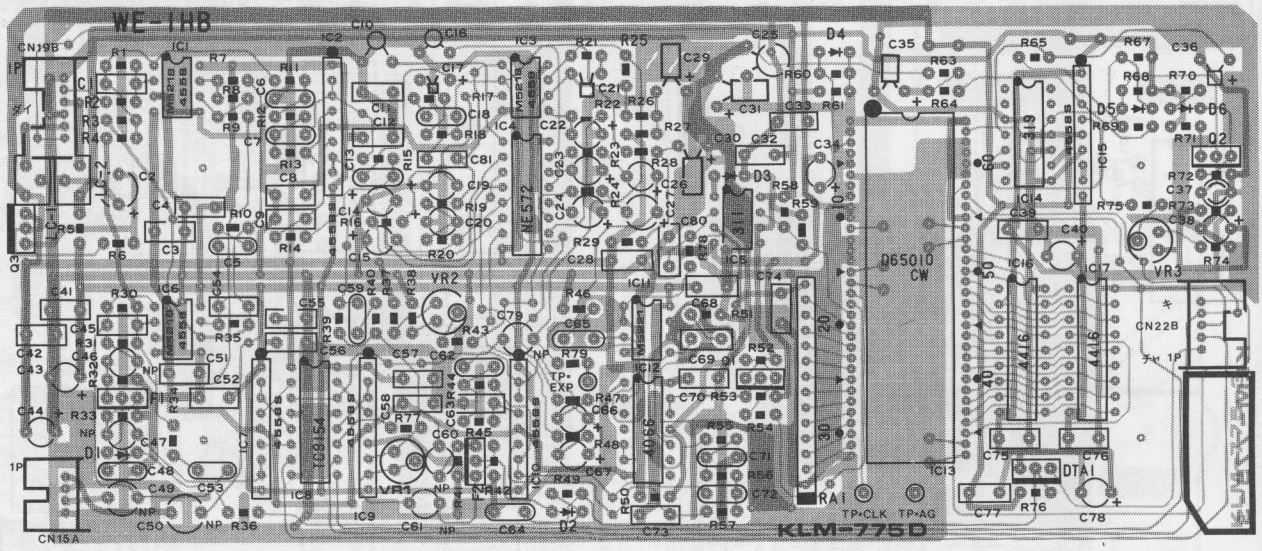
KLM-663

KLM-664

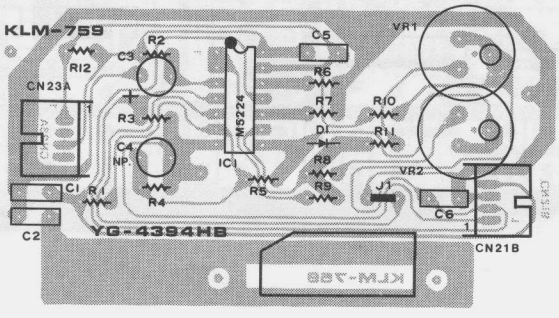
KLM-760


KLM-760
(X-300)
CAUTION FOR CONTINUED PROTECTION AGAINST THE RISK OF FIRE REPLACE ONLY WITH SAME TYPE FUSE.
ATTENTION UTILISER UN FUSIBLE DE RECHANGE DE MEME TYPE.
FUSE 125V 3A 250V T2A
FUSE 125V 3A 250V T2A

KLM-775



KLM-759

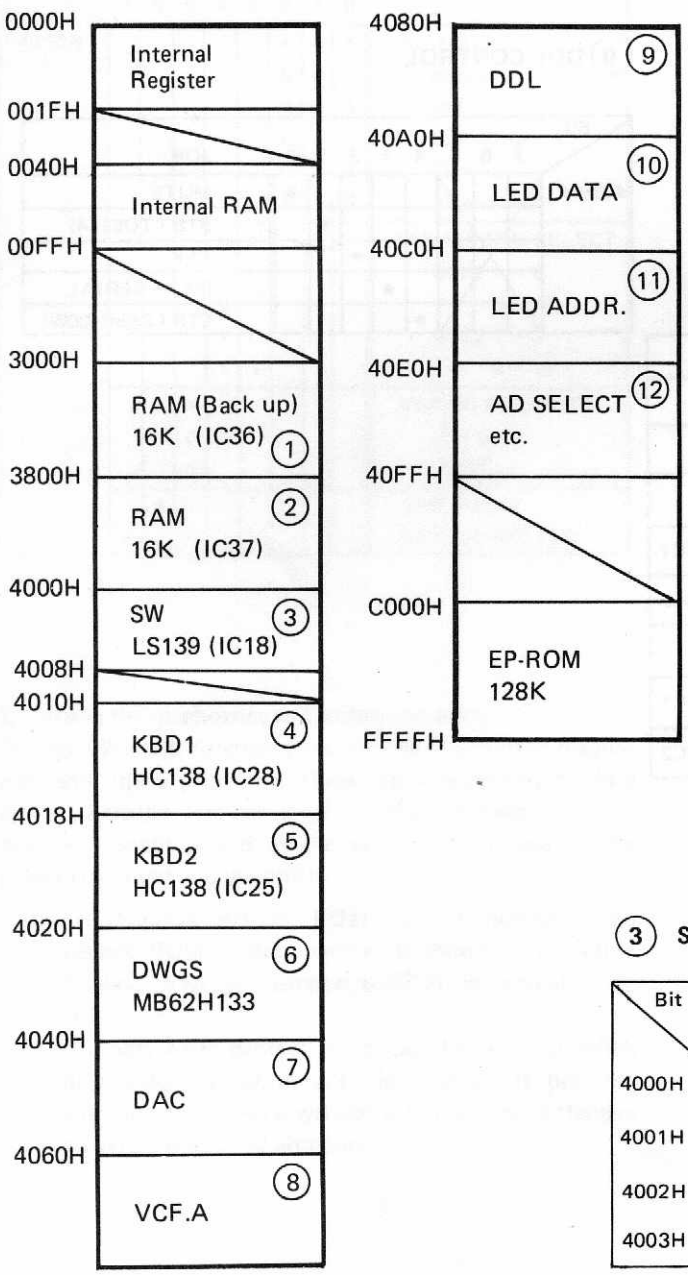


7. CIRCUIT DESCRIPTIONS

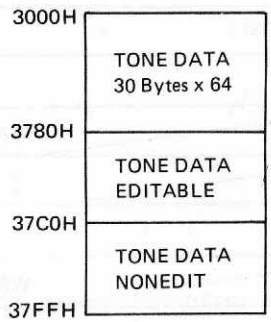
1. Hardware:

NAME	DESCRIPTION	PC BOARD
CPU 63B03X (8 bit, 2MHz)		KLM-661
ROM 27128 (N-MOS 16KB)	System program, data table	KLM-661
RAM1 6116 (C-MOS 2KB)	Tone data, backup	KLM-661
RAM2 6116 (C-MOS 2KB)	System use	KLM-661
Sound source DWGS	2 DC0 x 8 voice	KLM-661
Wave table ROM 613256	(256Kbit x 4) 16 Waveforms	KLM-661
VCF, VCA 2069		KLM-662
Digital delay		KLM-775

2. Memory map



① **RAM (Battery Back up) 16K Bytes**



② **RAM 16K Bytes**

FOR SYSTEM PROGRAM

③ **SW**

Bit	7	6	5	4	3	2	1	0
4000H	8	7	6	5	4	3	2	1
4001H	Tape Enab.	Wr. Enab.	WRITE	B.H	PAR	PRG	UP	DOWN
4002H	00T	MODE	LATCH	Arp. On/Off	UNS2	UNS1	POLY2	POLY1
4003H	IRG 1 Reset (LS74)							

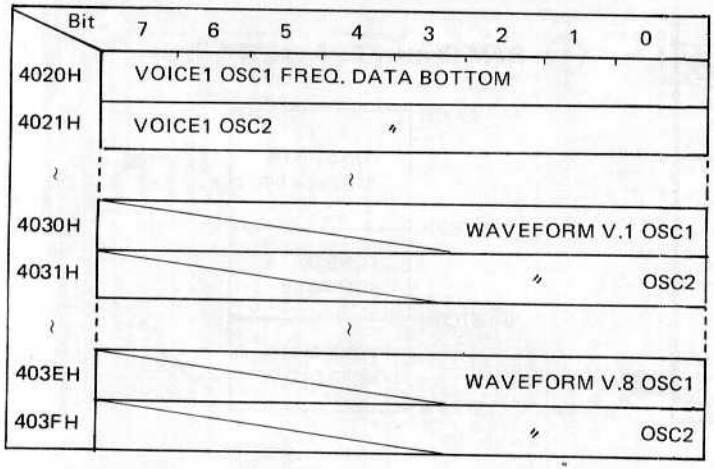
④ KBD1 (First Connection)

Bit	7	6	5	4	3	2	1	0
4010H	G1	F1	# F1	E1	# D1	D1	# C1	C1
4011H	# D2	D2	# C2	C2	B1	# A1	A1	# G1
4012H	B2	# A2	A2	# G2	G2	# F2	F2	E2
4013H	G3	# F3	F3	E3	# D3	D3	# C3	C3
4014H	# D4	D4	# C4	C4	B3	# A3	A3	# G3
4015H	B4	# A4	A4	# G4	G4	# F4	F4	E4
4016H	G5	# F5	F5	# E5	E5	D5	# C5	C5
4017H				C6	B5	# A5	A5	# G5

⑤ KBD2 (Second Connection)

4018H
≀ SAME AS KBD1 BIT MAP
401FH

⑥ DWGS


Bit 7 6 5 4 3 2 1 0
4020H VOICE1 OSC1 FREQ. DATA BOTTOM
4021H VOICE1 OSC2 〃
≀ ≀
4030H WAVEFORM V.1 OSC1
4031H 〃 OSC2
≀ ≀
403EH WAVEFORM V.8 OSC1
403FH 〃 OSC2

⑦ DAC – HC374 (IC19)

FOR DAC (HA17008) DATA LATCH 8 BIT

⑧ VCF, VCA EG SELECT

Bit	7	6	5	4	3	2	1	0	HEX	JOB
4060H	•	–	–	–	–	–	–	–		Fc 1 ~ 8
		–	–	–	–	–	–	–		
	–	1	1	1	1	–	–	–	78	INHIBIT
									58	LEVEL 1
									59	〃 2
									5A	RESONANCE
									5B	NOISE
									5C	MG 0V
									5D	DDL 0V
									60	VCA0 EG
									≀	≀
									67	VCA7 EG
									70	VCF0 EG
									≀	≀
									77	VCF7 EG

⑨ DDL CONTROL

Bit	7	6	5	4	3	2	1	0	JOB
4080H								•	MUTE
							•		STB (TOS154)
						•			CLK
					•				DATA SERIAL
				•					STB (D650100W)

⑩ LED ⑪ 4000H

	Bit	7	6	5	4	3	2	1	0	DISP.
40A0H	0	DOT	8	8	8	8	8	8	8	PRG H
	1									" L
	2	DOT								PAR H
	3									" L
	4									VAL H
	5	DOT								" L
	6	PRG	PAR			POLY1	UN1	UN2	POLY2	
	7	LATCH	ON/OFF	ASSIGN		FULL	2OOT	1OOT	TEMPO	

⑫ AD SELECT etc.

	Bit	7	6	5	4	3	2	1	0	
40E0H							•	•	•	AD SELECT
							0	0	0	Bender
							0	0	1	MG
							0	1	0	Edit Slider
							0	1	1	Tune
							1	0	0	After Touch
					•	•				WAVEFORM SELECT
					0	0				OSC1 1 ~ 8
					0	1				" 9 ~ 16
					1	0				OSC2 1 ~ 8
					1	1				" 9 ~ 16
				•						VCF EG POLARITY
				0						
				1						
			•							ARP. RESET
		•								ARP. TEMPO LED

3. Using the diagnostics and utility programs

To test DW-8000 functions you can use the built-in diagnostics and utility programs. These are executed by holding down particular number keys (in the synthesizer's "programmer" section) and at the same time turning on the power (i.e., resetting the unit).

1, 2: (1) Displays system ROM version number. The system ROM version number is shown in the value display. Version number 850708 is indicated by "07".

(2) Sets write protect attribute. This is useful when displaying the synthesizer in a shop. It prevents anything from being written into memory. Effective on versions 850709 and later.

5, 6: Reference voltage adjustment mode. Refer to the adjustment procedures.

7, 8: Tuning mode.
Tune fixed, touch sense maximums setting, voice indication.
Refer to adjustment procedures.

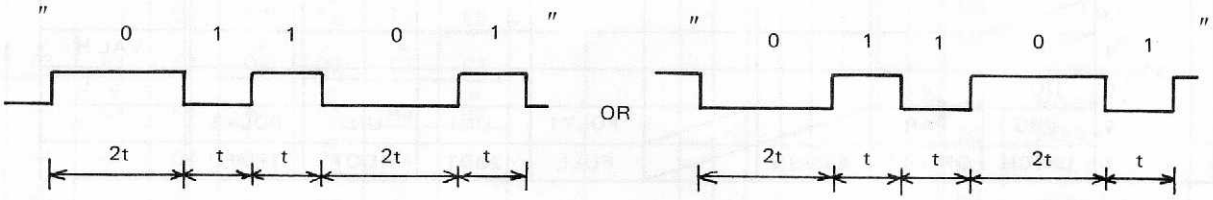
5, 8: RAM clear mode.
Erases 64 sound program settings from memory.

4. Tape interface format

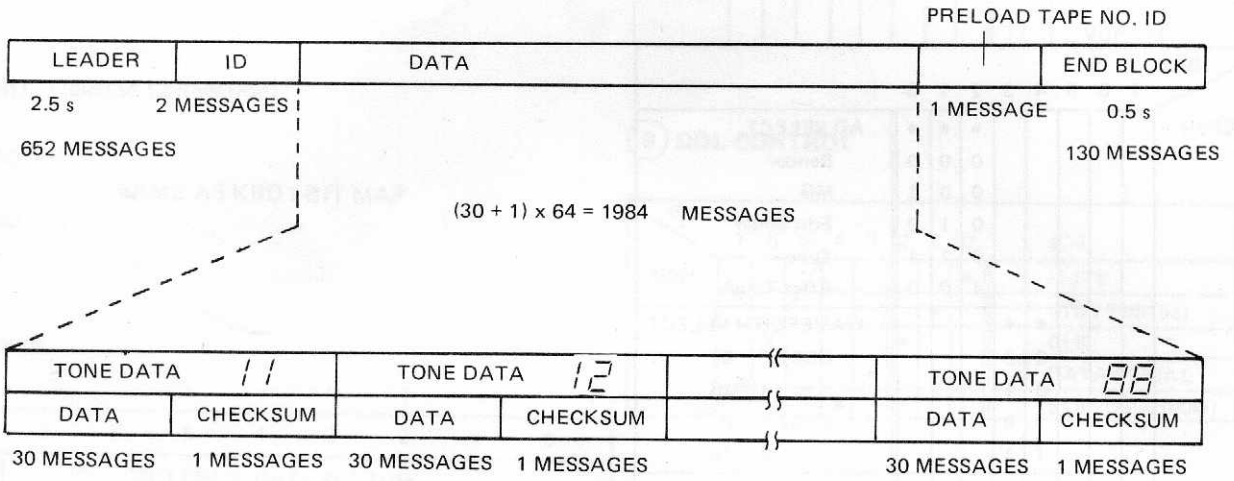
1. Modulation system

"1" . . . . . t = 320 μs
"0" . . . . . 2t = 640 μs

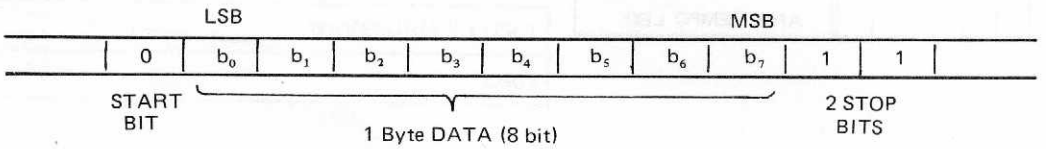
Example:



2. Format of one set of program data



3. Format of one message



3.1 LEADER DATA
"FF H" (652 MESSAGES)

3.2 ID DATA

ID1	"42 H"	KORG
ID2	"03 H"	X-300

3.3 CHECKSUM DATA
ONE TONE DATA

$$\sum_{n=1}^{30} Dn \text{ AND "FFH"}$$

3.4 PRELOAD TAPE No. ID (FOR TEST)
NORMAL "00 H"

3.5 END BLOCK DATA
"FFH" (130 MESSAGES)

5. Main circuit explanation

1) Keyboard scanning

The CPU outputs 3-bit addresses in the range A0~A2 which are decoded by the address decoder HC138 (IC25, IC28). The output of this decoder goes through connector CN10 (first contact) and CN11 (second contact) to the keyboard matrix for scanning.

Keyboard matrix output goes from connector CN6 through the inverting octal buffer HC240 (IC16 HD specification) to be passed to the data bus D0~D7.

2) Key on/off data and velocity data

Velocity data is computed using the CPU timer to measure the time from when the key contact leaves the first contact until it reaches the second contact.

KEY ON data is generated when the key contact reaches the second contact. Key off data is generated when the first contact is reached after leaving the second contact.

3) After Touch data

The ESK-901 keyboard's after touch unit (sandwich of metal plate, conductive rubber, and metal plate) produces impedance variations which KLM-759 detects as analog voltages over the range of 0V~3.5V.

The voltage passes through the multiplexer 4051 (IC5) to the CPU where, via a DAC, it changes the control voltage for the effect.

4) DWGS system

This board contains the DWGS basic system. The purpose of this system is to get pitch and waveform data from the CPU bus and output a cyclic (repetitive) waveform of constant amplitude.

Oscillator operation

The PAI (phase angle increment) value and PAR (phase angle register) value are added and the result is stored again in the PAR. The PAR value is used as the wave table address. The wave table stores different harmonic configuration data for each octave on the keyboard.

IC47 (MB64H129) performs the processing needed to use the PAR value as the wave table address.

Finally, data read from the wave table is converted to an analog waveform by a D/A converter.

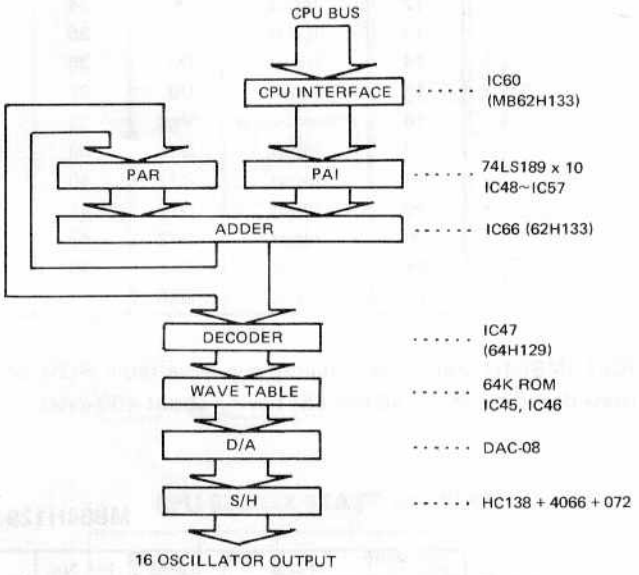
Time division multiplexing enables dual oscillator 6-voice sound source capability.

Maximum simultaneous output of this system is 8 voices x 2 oscillators.

Note: Given a sampling frequency of 50 kHz, PAI data $N = 2^{18} \times f/50 \times 10^3$ (where f is the pitch frequency) is rounded to an integer value for N and converted to a hexadecimal number.

The main LSI chips are the CMOS gate array IC47 (MB-64H129) and IC60 (MB62H133), the wave-table 256K mask ROM IC45 and IC46 (HN613256), the ten TTL 64-bit RAM chips for PAI & PAR (IC48~IC57; S189), the 8-bit D/A converter IC42 (DAC-08), decoder chips IC50, IC59 (LS244), KLM-662 IC16 (LS175), IC14, IC15 (LS138), as well as S/H analog switches (IC17~IC20; 4066) and OP AMPS (IC21~IC25; 072).

IC60 (MB62H133) is a 64-pin LSI with about 800 gates handling major aspects of the system including the CPU interface, timing generation, and adder.



MB62H133 TERMINAL NAMES

Pin No.	Type	Term	Pin No.	Type	Term	Pin No.	Type	Term
1	Input	A0	23	Input	CS	44	Bus	DB18
2	Input	A1	24	Input	WR	45	Bus	DB17
3	Input	A2	25	Input	RST	46	Bus	DB16
4	Input	A3	26	Input	CLK	47	Bus	DB15
5	Input	A4	27	Output	SHEN	48	Power supply	V_{SS}
6	Input	D0	28	Output	VN3	49	Bus	DB14
7	Input	D1	29	Output	VN2	50	Bus	DB13
8	Input	D2	30	Output	VN1	51	Bus	DB12
9	Input	D3	31	Output	VN0	52	Bus	DB11
10	Input	D4	32	Power supply	V_{DD}	53	Bus	DB10
11	Input	D5	33	Output	RAMC	54	Bus	DB9
12	Input	D6	34	Output	WFW	55	Bus	DB8
13	Input	D7	35	Output	PAIW	56	Bus	DB7
14	Input	D8	36	Output	PAIS	57	Bus	DB6
15	Input	D9	37	Output	PARW	58	Bus	DB5
16	Power supply	V_{SS}	38	Output	PARS	59	Bus	DB4
17	Input	D10	39	Output	WFG	60	Bus	DB3
18	Input	D11	40	Output	OCT2	61	Bus	DB2
19	Input	D12	41	Output	OCT1	62	Bus	DB1
20	Input	D13	42	Output	OCT0	63	Bus	DB0
21	Input	D14	43	Bus	DB19	64	Power supply	V_{DD}
22	Input	D15						

IC47 (MB64H129) is used mainly for wave table ROM address decoding; it is a 40-pin LSI having about 400 gates.

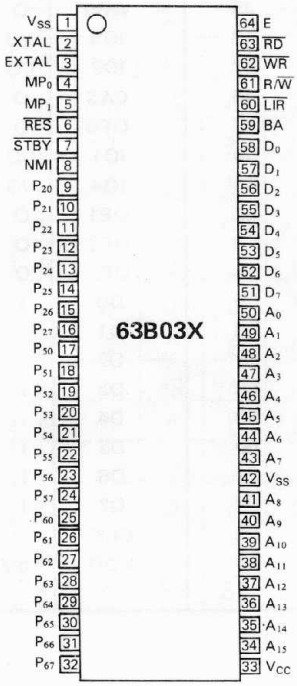
MB64H129 TERMINAL NAMES

Pin No.	Type	Term	Pin No.	Type	Term	Pin No.	Type	Term
1	Input	DB0	15	Input	OCT0	28	Output	AO9
2	Input	DB1	16	Input	OCT1	29	Output	AO8
3	Input	DB2	17	Input	OCT2	30	Power supply	V_{DD}
4	Input	DB3	18	Input	WFG	31	N.C.	
5	Input	DB4	19	Input	FNG	32	Output	AO7
6	Input	DB5	20	Input	RST	33	Output	AO6
7	Input	DB6	21	N.C.		34	Output	AO5
8	Input	DB7	22	Output	CEC	35	Output	AO4
9	Input	DB8	23	Output	CEB	36	Output	AO3
10	Power supply	V_{SS}	24	Output	CEA	37	Output	AO2
11	N.C.		25	Output	AO12	38	Output	AO1
12	Input	DB9	26	Output	AO11	39	Output	AO0
13	Input	DB10	27	Output	AO10	40	N.C.	
14	Input	DB11						

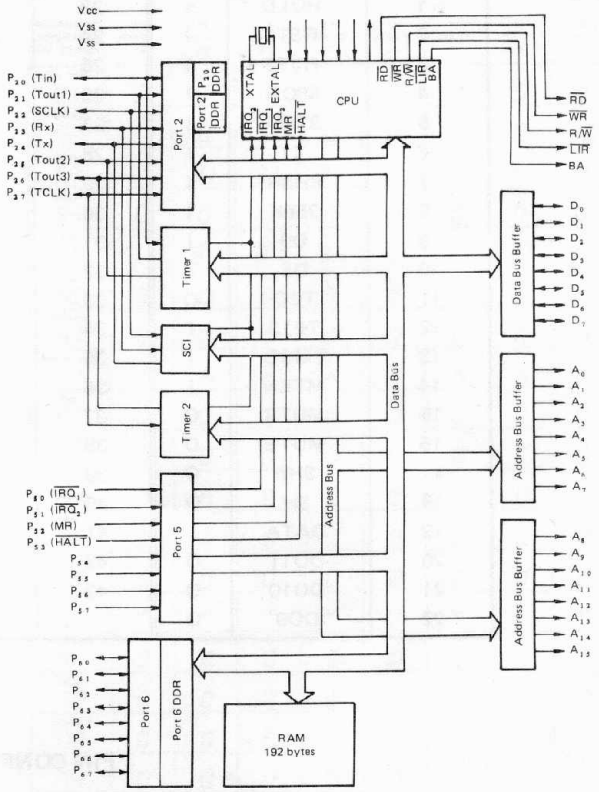
IC45 and IC46 (HN613256) store digitally encoded harmonic waveforms of the harmonics 2, 5, 10, 20, 40, 80, 160 and 320.

Here a waveform including the 320th harmonic refers to addition of the sine value 320 times at a particular phase.

PIN CONFIGURATION



BLOCK DIAGRAM



CPU 63B03X STATE OF PORT

Port	Pin	Function
P20	9	Velocity Sens. Control 3 Bit
P21	10	Velocity Sens. Control 2 Bit
P22	11	Velocity Sens. Control 1 Bit
P27	16	Velocity Sens. Control 0 Bit
RX	12	MIDI RX
TX	13	MIDI TX
P25	14	TAPE OUT
P26	15	TAPE OUT
IRQ1	17	Arpeggio Clock
P51	18	Joy Stick –Y or +Y
P52	19	A/D Compare
P53	20	+5
P54	21	Portamento Pedal
P55	22	Program Up Pedal
P56	23	Damper Pedal
P57	24	TAPE IN
P60	25	DWGS FREQ. DATA D15
P61	26	DWGS FREQ. DATA D14
P62	27	DWGS FREQ. DATA D13
P63	28	DWGS FREQ. DATA D12
P64	29	DWGS FREQ. DATA D11
P65	30	DWGS FREQ. DATA D10
P66	31	DWGS FREQ. DATA D 9
P67	32	DWGS FREQ. DATA D 8

5) Panel switch scanning

In similar fashion to keyboard scanning, 2-bit addresses in the range A0~A1 are decoded by the address decoder LSI139 (IC18) and supplied to the switch matrix. The output goes to octal buffer HC240 (IC16) (the same as used by the keyboard) and is passed to the data bus.

6) LED Display

The LED display is software controlled. Latch HC374 (IC22, IC24) takes LCD display data from the D0~D7 8-bit data bus to operate LED drivers 54513 and 54562.

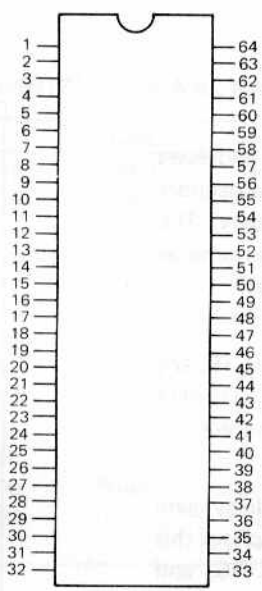
7) Digital delay

The KLM-775 board has its own dedicated delay gate array, μPD65010CW-113. The delay circuit comprises this gate array, 64KB dynamic RAM x 2, ADC, DAC, and analog compander. The delay time can be specified.

μPD6510 CW-113 TERMINAL NAMES

Pin No.	Pin Name	I/O	Pin No.	Pin Name	I/O	Pin No.	Pin Name	I/O
1	HOLD	I	23	DO8	O	44	A0	O
2	RST1	I	24	DO7	O	45	WR0	O
3	RST2	I	25	DO6	O	46	IO3	I/O
4	SPON	I	26	DO5	O	47	IO2	I/O
5	STRT	I	27	DO4	O	48	CAS	O
6	X1	I	28	DO3	O	49	OE0	O
7	PRSR	I	29	DO2	O	50	IO1	I/O
8	256K	I	30	DO1	O	51	IO4	I/O
9	D9	I	31	DO0	O	52	OE1	O
10	D8	I	32	GND	0V	53	OE2	O
11	TCO	O	33	WR3	O	54	OE3	O
12	TE13	I	34	WR2	O	55	D0	I
13	TMOD	I	35	WR1	O	56	D1	I
14	MTEN	I	36	A7	O	57	D2	I
15	MUTB	O	37	A4	O	58	D3	I
16	MUTE	O	38	A3	O	59	D4	I
17	SHB	O	39	A5	O	60	D5	I
18	SH	O	40	A2	O	61	D6	I
19	DATA	I	41	A6	O	62	D7	I
20	DO11	O	42	A1	O	63	CLK	I
21	DO10	O	43	RAS	O	64	V_{DD}	+5V
22	DO9	O						

PIN CONFIGURATION



8. ADJUSTMENT PROCEDURES

PROGRAM NO.	11	12	13	14	15	16	17	18	21
ASSIGN MODE	POLY1	POLY1	POLY1	POLY1	POLY1	POLY1	POLY1	POLY1	POLY1
PARA.MEMORY	13	23	31	31	26	72	72	71	73
OSC1 oct	8	8	8	8	8	8	8	8	8
waveform	16	16	16	16	6	16	16	16	16
level	31	0	0	0	0	31	31	31	31
A.BEND sl.	0	0	0	0	0	0	0	0	0
mode	⌐	⌐	⌐	⌐	⌐	⌐	⌐	⌐	⌐
time	0	0	0	0	0	0	0	0	0
int	0	0	0	0	0	0	0	0	0
OSC2 oct	8	8	8	8	8	8	8	8	8
waveform	16	16	16	16	16	16	16	16	16
level	0	31	0	0	0	0	0	0	0
interval	1	1	1	1	1	1	1	1	1
detune	0	0	0	0	0	0	0	0	0
NOISE level	0	0	0	0	31	0	0	0	0
VCF cutoff	63	63	32	44	63	63	63	63	63
resonance	0	0	31	31	0	0	0	0	0
kbd track	0	0	0	0	0	0	0	0	0
polarity	⌐	⌐	⌐	⌐	⌐	⌐	⌐	⌐	⌐
eg int	0	0	0	0	0	0	0	0	0
VCF attack	0	0	0	0	0	0	0	0	0
decay	0	0	0	0	0	0	0	0	0
break.p	0	0	0	0	0	0	0	0	0
slope	0	0	0	0	0	0	0	0	0
sustain	0	0	0	0	0	0	0	0	0
release	0	0	0	0	0	0	0	0	0
velocity	0	0	0	0	0	0	0	0	0

HELP KEY = (GRPH + H)

PROGRAM NO.	11	12	13	14	15	16	17	18	21
ASSIGN MODE	POLY1	POLY1	POLY1	POLY1	POLY1	POLY1	POLY1	POLY1	POLY1
PARA.MEMORY	13	23	31	31	26	72	72	71	73
VCA attack	0	0	0	0	0	0	0	0	0
decay	0	0	0	0	0	0	0	10	10
break.p	31	31	31	31	31	31	31	0	0
slope	0	0	0	0	0	0	0	0	0
sustain	31	31	31	31	31	31	31	0	0
release	0	0	0	0	0	0	0	10	10
velocity	0	0	0	0	0	0	0	0	0
MG w.form	^	^	^	^	^	^	^	^	^
freq	0	0	0	0	0	0	0	0	0
delay	0	0	0	0	0	0	0	0	0
osc	0	0	0	0	0	0	0	0	0
vcf	0	0	0	0	0	0	0	0	0
BEND osc	0	0	0	0	0	0	0	0	0
vcf	off	off	off	off	off	off	off	off	off
DDL time	0	0	0	0	0	0	0	3	0
factor	0	0	0	0	0	15	0	0	0
feedback	0	0	0	0	0	0	0	15	15
frequency	0	0	0	0	0	0	0	0	0
int	0	0	0	0	0	0	0	0	0
effect lev	0	0	0	0	0	15	15	15	15
PORTA time	0	0	0	0	0	0	0	0	0
A.T osc mg	0	0	0	0	0	0	0	0	0
vcf	0	0	0	0	0	0	0	0	0
vca	0	0	0	0	0	0	0	0	0

Caution:

1) This product has been throughly adjusted at the factory before shipment. Therefore never turn any Semi Fixed VRs other than those required for servicing.
2) After turning on power, wait at least 15 minutes before beginning test and adjustment.
3) Be sure to save the data on tape before loading test data as when loading test data into DW-8000, previous data is erased.

1. Clearing RAM and Loading Test Data

1) After keeping DW-8000 power on at least 15 minutes, once turn off power and then on pressing number keys [5] and [8].
2) Connect to an Amplifier etc. and confirm if there is no sound to check all data of RAM have been erased.
3) Load Test Data.

*For convenience, save those chart on tape as Check and Adjustment procedure described below is always made with the data.

2. D/A converter, CV Check and Adjustment Procedure (KLM-661)

1) Turn off power and then on pressing number keys [5] and [6] at the same time.
2) Confirm if UrEF (Voltage reference) is displayed and becomes Test Mode 1.
3) Connect a Digital Voltmeter to Test Points: [TP-AG], [TP-REF1] allocated in left side of the board.
GND side – [TP-AG], +side – [TP-REF1]
4) Memorize the value of Digital Voltmeter and then connect as follows.
+side – [TP-CV]
5) Adjust VR1 to obtain the same value as one of +side – [TP-REF1].

Remarks: Adjustment value is in range of 3.29V – 3.64V.
Note: Test Mode 1 cannot be cancelled till being reset. (Power OFF – ON)

3. VCA Level Check and Adjustment (KLM-662)

Turn off power and then on pressing number keys [7] and [8] and Test Mode becomes 2.

Oscillating voice is displayed on LED Display with any singie key being played under this mode.

Note: It must be Test Mode 2 though voice displaying is not required.

1) Select Program number 11.
2) Connect an Oscilloscope to [TP-SG] (GND side – [TP-AG]) and observe amplitude of output waveform.
3) Press C5 key and observe waveform described in Fig. 1.
4) Adjust Semi Fixed VRs (VR101 – VR801) of oscillating voice (refer to Voice Display) to obtain waveform of amplitude being 0.7VP-P.

Remarks: Allowance of deviation of each voice is under 40mV.

4. OSC 2 Level Check and Adjustment (KLM-662)

1) Select Program number 12.
2) Make same adjustment as VCA Level one.
3) Necessary Semi Fixed VRs for adjustment are among VR105 – VR805 of oscillating voice. (refer to Voice Display)

5. VCF Resonance Check and Adjustment (KLM-662)

1. Level

1) Select Program number 13.
2) Connect an Oscilloscope to [TP-SG]. (GND side to [TP-AG])
3) Press any single key and confirm amplitude of output waveform of each voice is 0.9VP-P. Unless, adjust Semi Fixed VRs among VR103–VR803 of oscillating voice.

Remarks: Allowance of deviation of each voice is under 40mVP-P.

2. fo

1) Select Program number 13.
2) Connect Chromatic Tuner AT-12 to Output Jack of DW-8000.
3) Press any single key and confirm oscillation frequency of each voice on AT-12 Display is C (523Hz), 1 octave, 0 cent.
4) Unless, adjust Semi Fixed VRs among VR102 – VR802 of oscillating voice.

Remarks: Allowance of deviation of each voice is 0 cent ± 10 cent.

3. fc

1) Select Program number 14.
2) Connect Chromatic Tuner AT-12 to Output Jack of DW-8000.
3) Press any single key and confirm oscillation frequency of each voice on AT-12 Display is C (2093Hz), 3 octave, 0 cent.
4) Unless, adjust Semi Fixed VRs among VR104 -- VR804 of oscillating voice.

Remarks: Allowance of deviation of each voice is under 0 cent ± 10 cent.

6. Noise Level Check and Adjustment (KLM-662)

1) Select Program number 15.
2) Connect a Noise Meter to [TP-SG] (GND side – [TP-AG]).
3) Press any single key and confirm value of the meter is –15dbm.
4) Unless, adjust VR1 to obtain correct value.

7. DWGS Clock Check and Adjustment (KLM-661)

1) Connect a Frequency Counter to [TP-CLK] (GND side to [TP-DG]).
2) Confirm the counter value is in range of 6.395MHz – 6.405MHz.
3) Unless, adjust VR2 to obtain correct value.

8. Digital Delay MG-CLK Check and Adjustment (KLM-775)

1) Select Program number 16.
2) Connect a Frequency Counter to [TP-CLK] (GND side to [TP-AG]).
3) Confirm the counter value is 20.0kHz. (Effective with 3 figures only.)
4) Unless, adjust VR3 to correct value.
5) After 3) is confirmed, select Program number 17.
6) Confirm the counter value is in range of 35.0kHz – 40.0kHz.

9. Digital Delay Output Waveform Center Position Check and Adjustment (KLM-775)

1) Select Program number 17.
2) Connect an Oscilloscope to [TP-EXP] (GND side to [TP-AG]). Adjust lit line of the Oscilloscope to 0 volt line of the screen.
3) Press C5 key and confirm center of amplitude of output waveform is on 0 volt line of the screen.
4) Unless, adjust VR2 to obtain correct position.

10. Digital Delay Feed Back Check and Adjustment (KLM-775)

1) Select Program number 18.
2) Press C5 key and confirm if delayed sound lasts 2 seconds without no ringing.
3) Unless, adjust VR1. (Start to ring when turn to the right. Turn to the left and adjustment point is where ringing stops.)
4) After 2) is confirmed, select Program number 21.
5) Press C5 key and confirm if there is no ringing with delayed sound.

11. Check and adjustment of keyboard after touch effect

Purpose: This should be performed if the keyboard is replaced or in other cases when it is necessary to assure balanced response and compensate for differences in the weight of individual keys.

1) Remove connector CN23 from KLM-759 and connect a digital multimeter (DVM or other device that measures impedance) to the 1-pin (output) and 3-pin (GND or earth).

2) Place a 1,500 gram weight on each key in sequence and note the keys that give the lowest (the low weight key) and highest (the high weight key) impedance values. Mark these two keys (with tape, etc.).

General standard: The low weight key is a white key and has an impedance value of 3 ohms or less.

The high weight key is a black key and has an impedance value of 500 ohms (±10%).

3) Connect an oscilloscope to KLM-759 CN21 1-pin (output) and 3-pin (GND).
Connect to CN23 which was previously disconnected.

4) Place a 500g weight on the front of the low weight key found above.
Adjust VR1 so that output voltage crosses the 0V line (rising from − to +) within 2 to 8 seconds of loading the key with the weight.
(Threshold voltage level adjustment.)

5) Next, put a 1,500 gram weight on the front of the high weight key and adjust VR2 so that the output voltage crosses the +3.5V line within 2 to 8 seconds of loading the key with the weight.
(Buffer amp gain adjustment.)